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MAGNETITE MINES AT LYON MOUNTAIN, N. Y.

The Geology of an Interesting District, Nature of the Ore, and Methods of Mining

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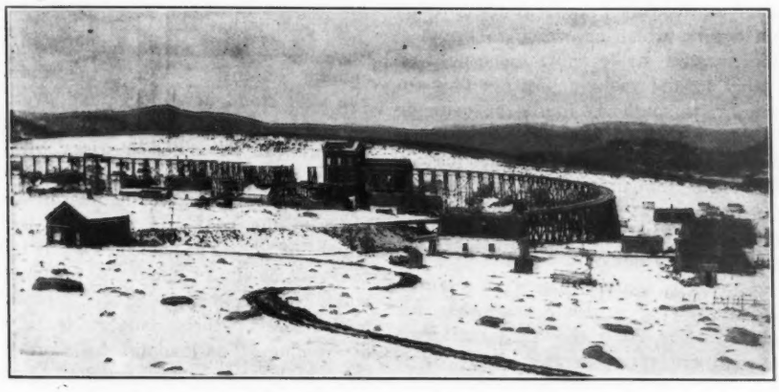
The Lyon Mountain or Chateaugay mines, situated in Clinton county, 36 miles west of Plattsburg, are among the noteworthy iron mines of New York State. The orebodies are of large size and though rather lean in character they yield by concentration an excellent product, exceptionally low in phosphorus and sulphur.



MINE AND TRESTLE AT LYON MOUNTAIN

The mines were first worked about 1867. In the early period of their operation, they supplied a good deal of ore to the local charcoal bloomaries, which once constituted an important industry in the northern Adirondacks. The extension of the Dannemora & Plattsburg railroad to the mines in 1879 established communication with the outside ore markets and soon led to enlarged exploitation. In 1881 the Chateaugay Ore and Iron Company was organized and operated the mines until 1902 when they were taken over by the present owners, the Delaware & Hudson Company. The total shipments from the beginning to the present time may be placed at approximately 4,000,000 long tons. A large part of the shipments is made up on concentrates, averaging 65 per cent. Fe. Milling was undertaken on a commercial scale about 20 years ago; at first wet methods were employed, but they have since been superseded by magnetic concentration.

Lyon mountain lies on the northeastern border of the Adirondacks, near the junction of the Precambrian gneisses with the overlying Paleozoic sediments. Lyon mountain itself, which attains an altitude of 3800 ft., marks the culminating point of the last of the higher ridges in this section. Toward the north and east the ridges are succeeded by the foot-hill region, which soon gives way to the valley plains of the St. Lawrence and Lake Champlain.

MILL AT LYON MOUNTAIN

GEOLOGICAL CONDITIONS

The deposits outcrop on the northwestern slope of Lyon mountain near the base, in association with a reddish granular gneiss. This formation is strongly developed in the region and according to the studies of H. P. Cushing probably belong to the basal portion of the Adirondack gneiss series, occupying a similar place in the geologic scale to the Ottawa gneiss among the Precambrian rocks of Canada. The prevailing constituents are acid feldspar (microperthite, orthoclase and microcline) and quartz, with which augite and hornblende are usually associated. The accessory minerals include titanite, zircon and apatite. Normally the composition is that of granite, though some phases contain little or no quartz, showing an approach to syenite. In the immediate vicinity of the orebodies there is usually an increase in the proportion of hornblende and augite, as well as the magnetite, which gives the rock a darker, more basic appearance. The gneiss seldom exhibits any marked bending or schistosity, though there is generally more or less parallelism in the arrangement of the constituents. The deposits have been variously described as beds, sheets or veins, but in using these terms the writers apparently have referred rather to the shape of the orebodies than to their derivation. The ore is aggregated along sheet-like zones, which are distinguished from the country rock only by their abnormal richness in magnetite. It can scarcely be said that any well defined walls exist, as the relation of the ore to the gneiss is one of gradation. Two and, in the central portion, three parallel bodies, separated by several feet of gneiss, have been found.

CHARACTER OF THE ORE

In character the ore varies rather widely. The average grade may be said to consist of about equal proportions of magnetite and gangue minerals, the latter comprising feldspar, quartz, pyroxene and

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the other constituents of the wall rock. The magnetite is sometimes distributed uniformly throughout the mass, or it may be aggregated in bands that alternate with the gangue. Occasionally stringers of magnetite occur which seem to fill small fissures or rifts and to have been a later introduction. In the course of operation masses of pure magnetite of considerable size are encountered; formerly they were the special object of mining but they are now removed and sent to the mill with the ordinary ore.

A minor but interesting geological feature is the occurrence of numerous dikes intersecting the orebodies. They represent at least two series of intrusions, an older one composed of reddish granite, and a later series consisting of diabase. The granite dikes resemble the gneiss in composition, though finer grained and more massive in texture. They carry, however, little magnetite. They usually follow the course of the orebodies. The diabase dikes mostly strike transverse to the latter and have a vertical dip, while a few strike parallel to the ore and dip in an opposite direction. In contact with the dikes the magnetite has a noticeably bluish tint, but otherwise has been little affected.

Pegmatite is a frequent associate of both the ore and the gneiss. It rarely takes the form of dikes with parallel walls, but occurs in lenticular masses, nests and streaks. It frequently carries sufficient magnetite to make it valuable as an ore. Owing to its coarse texture it decomposes readily under the action of ground water, leaving vugs and cavities that afford beautiful crystallizations of apatite, hornblende, feldspar, scapolite and other minerals of secondary deposition.

The orebodies possess a remarkable degree of persistency along the strike. On the southern section they have been opened by slopes and levels almost continuously from shaft 16 at the old mill to the Burden mine, a distance of 3800 ft. Northeast of shaft 16, there is an interval in which the deposits have not been worked, though the existence of ore is shown by outcrops and magnetic readings; but at a distance of 2500 ft. is the Williams mine which is said to have been the first exploited. The Parkhurst shaft, two miles northeast of the Williams, and the Phillips and mine 81 southwest of the Burden, lie along the same zone.

Throughout most of their extent the deposits have undergone little disturbance in the way of faulting and folding. The dip which is about 70 deg. northwest at shaft 16 near the old mill, however, gradually flattens toward the southwest and is about 45 deg. at shaft 5. At this point the deposits have been bent into a rather sharp fold so that the strike changes from northeast-southwest to nearly east-west while the dip swings around the north. This change is accompanied by shearing and minor folding in the deposits, and probably also by faulting.

EXTENT OF THE OREBODIES

The width of the valuable ore in the front or western "vein" north of shaft 5 averages about 20 ft. The middle and back veins are said to have an equal width, but they have been little exploited in that direction. On the western wing the outcrop widens markedly, as shown in the Burden mine which has been found to be over 100 ft. wide at the surface. In the Hall shaft, between the Burden and shaft 5, the bottom levels have a width of over 200 ft. This widening so far as it is due to the smaller angle of dip is, of course, only apparent, but there is no doubt that the deposits west of shaft 5 are actually much enlarged.

Beyond the Burden mine, the relations of the orebodies have not been definitely established. The outcrop is here concealed beneath heavy drift. About 2000 ft. west of the Burden mine a second group of deposits known as the Phillips vein occurs, which according to the magnetic surveys strikes northeast-southwest parallel to the main deposits. The dip, however, is southeast in the opposite direction to that of the latter. It seems quite possible that these deposits may be a faulted continuation of the main group.

The Parkhurst and mine 81, of which mention has been made, have yielded considerable quantities of ore in the past and are known to contain important reserves, although, owing to their somewhat remote situation from the main workings, they are not now operated. Mine 81 is about four miles southwest of Lyon mountain and one mile from Standish. The orebody has a northeast-southwest strike and a high dip to the southeast. Where exposed near the surface it shows a width ranging from 15 to 25 ft. It is opened by two shafts 400 ft. apart reaching a depth of a little more than 100 ft. Parkhurst shaft, lying about 2½ miles northeast of Lyon mountain, is opened to a depth of about 200 ft. The ore from both mines resembles that obtained in the central group, though it is said that the Parkhurst ore is somewhat higher in phosphorus.

MINING

When the mines at Lyon mountain were first opened, they were worked under lease by contractors. The output was obtained mostly from the outcrop by quarrying methods and particular attention was given to the rich central portion of the deposits. The ore was roughly cobbed by hand and hauled by teams over planked roads to the Catalan forges at Belmont, Moffitsville and Clayburg, a distance of 12 to 15 miles. The bloom iron made from the ore won a widespread reputation for its excellent quality.

After the Chateaugay Ore and Iron Company took over the mines, operations were undertaken on a more extensive scale, though there seems to have been little method in the way in which they were conducted. Slopes were sunk on the ore at frequent intervals, until about 25 hoisting shafts were at work simultaneously within a distance of 3600 ft. along the outcrop. The ore was underhand stoped on both sides of the slopes, with an occasional pillar left to support the walls. The extension of the workings in depth in time necessitated a modification of these crude methods. A system of levels 50 ft. apart vertically was then laid out and only 6 or 8 slopes were maintained for hoisting purposes. The stopes in the levels were generally carried about 35 ft. high, thus leaving about 15 ft. of ore between the levels. This method was simple, but entailed expensive loading and tramming while a good deal of the ore had to be left as a support to the walls.

Under the present management a scheme of operations conforming to modern methods has been drawn up which it is expected will considerably lessen the mining expenses. When the walls of the vein stand at 40 deg. and over, the back-stope system will be used, whereby the ore can be mined in rises with the broken material left in place on which the men can work. They will then always be close to the roof and can keep careful watch of it. The danger from falling roof will be almost eliminated; at present, when working with high open roofs, in open levels, this danger is always threatening. The loading of the ore from the back-stopes by gravity directly through chutes into the cars also will make it possible to abandon the expensive shovel loading from the level bottoms. The ore can be taken out from wall to wall.

From the chutes, the ore will be brought to the hoisting stopes by electric locomotives and there loaded into the skips from large storage pockets. Only a few of the present hoisting slopes will be maintained, and these will be furnished with double track for balance hoisting. Electric hoisting engines are contemplated. The slopes that will be used according to the plan are No. 4 for the western part of the mine and No. 14 for the eastern part. No. 4 is already down to a vertical depth of about 820 ft. and a slope length of not less than 1400 ft. Slope No. 14, the bottom of which is on about 50 ft. higher elevation, is now being sunk to the same level and the two will be connected at the bottom by a main gang-way. In side-drifts from this main gang-way the loading chutes from the raises will be located.

Beside the ore from the underground workings, a considerable quantity has been obtained during the last few years from the open cuts at the west end of the back vein. This vein has here a width of about 150 ft. The ore is a little higher

in iron content than that mined underground. Five derricks, some of them furnished with swinging gear, are used. From 400 to 500 tons of ore are daily sent to the mill from these quarry operations.

POWER PLANT

During the past winter the erection of a 3000-h.p. central power-station was started. This will replace the small power plants which are now scattered around at the hoisting slopes and at the old separating plant. Early in the year the first third of the new power station was completed and put in operation, developing about 1000-h.p. The boiler room is a steel-frame brick building and is supplied with three Stirling water-tube boilers, each rated at 353-h.p. under 150 lb. working pressure. Each boiler has 3532 sq.ft. of heating surface with 115.65 sq.ft. of grate surface. The grates are arranged for bird's-eye coal and furnished with automatically acting steam blowers.

The coal-storage plant in connection with the boiler room is so arranged that a tunnel in level with the boiler room floor runs under the coal pile and the coal is loaded through overhead valves in the tunnel roof directly into steel cars of 1 ton capacity. These cars run on an industrial railway (C. W. Hunt system) with track extending along the entire front of the boilers. All coal brought in is weighed before it is used, and the weight is noted in the journal in the boiler room. The firing is done directly from the cars.

The stocking of the coal is done by means of an inclined track with an automatic dumping skip. The lower end of the track extends under a small bin below the railroad. The industrial railway is extended under this bin so that the coal can be brought directly into the boiler room without first having to be dumped on the stock pile. The stock pile will contain 1000 tons, enough for two months' supply.

In the engine room one 500-kw. turbo-generator is now in operation, furnishing power for the new separator. The turbine is of the Curtis type from the General Electric Company and is designed to operate condensing, although the condenser has not yet been installed. It is running with a speed of 1800 r.p.m. The current generated is a 60 cycle, three-phase, alternating current of 1150 volts and 250 amp. per phase. The variation in speed from no load to full load does not exceed 4 per cent. The steam consumption per kw. per hour is guaranteed not to exceed 21 lb. at full load, when the turbine is running condensing and the steam pressure at the throttle is 150 lb. The exciting current is furnished by a 25-kw. horizontal Curtis turbo-generator, making 3600 revolutions. The current generated is of 125 volts and is used also for lighting the power station.

AIR COMPRESSOR

The air compressor installed in the same engine room was supplied by the Laidlaw, Dunn, Gordon Company. It is a cross compound two stage compressor with cylinder dimensions 15 and 25, 27 and 17 x 24 in. It is furnished with mechanically moved semi-rotary air valves of a type known as the Cincinnati air valve gear. This valve gear controls mechanically the opening and closing of the suction and the closing of the discharge. The opening of the discharge is effected by means of poppet valves. At the end of the stroke the rotary valve closes, thus retaining under the poppet valve a cushion of air under receiver pressure. There is consequently no need of a sharp close of the poppet valves, as they have the whole return stroke in which to seat themselves. The valve gear works smoothly and efficiently The arrangement of the cylinders is noteworthy in that the air cylinders are placed next to the fly-wheel. The reason for this arrangement is that if in the future, as contemplated, transmitted water power can be obtained, the steam end of the air compressor will be cut off and the compressor can be driven by motor. For this reason also the fly-wheel is furnished with grooves for rope drive. The compressor runs with 125 r.p.m. and compresses 2000 cu.ft. free air to 80 lb. pressure.

In the basement of the engine room are installed the auxiliaries—the feed-water pumps, a Cochrane 1000-h.p. feed-water heater, etc.—and space is provided for the condenser. The permanent steel building, 42x90 ft. with traveling crane is now being erected and a second 500-kw. steam turbine and a second air compressor of the same kind as the ones already installed in operation are also being installed.

(To be continued.)

Pure manganese can now be made by the thermit process on an industrial scale in large quantities. It has gradually found increasing use as a deoxidizer in the production of alloys and has somewhat displaced ferro-manganese. Another use to which it is put is the deoxidation of tin; melters of tin report that 100 lb. of pure manganese act successfully as a deoxidizer for 50 tons of tin.

Cheap steel-wire goods are now coppered in large quantities by dipping into a solution of water, 1 gal.; copper sulphate, 1 oz.; sulphuric acid, 1 oz. This solution is used cold and the steel must be freed from grease and polished. An immersion of a few seconds usually suffices for the formation of the required deposit on steel.

An explosion of firedamp recently occurred in a metalliferous mine. The peculiar accident is attributed to the rotting of old timbers under water.

Effect of Moisture on the Strength and Stiffness of Wood

Little is known about the influence of moisture on the strength of wood. The United States Forest Service has been making a thorough study of it and the results of its investigation are about as follows:

The relation of moisture to strength follows a definite law. Proper drying greatly increases the strength of all kinds of wood, the amount of increase depending upon the species and the dryness. For example, the strength of a piece of unseasoned red spruce may be increased over 400 per cent. by a thorough drying at the temperature of boiling water. Strength decreases again, however, as the wood reabsorbs moisture. Air-dried wood, protected from the weather, and containing 12 per cent. of moisture, is from 1.7 to 2.4 times stronger than when green, according to the species. Stiffness is also increased by drying. These conclusions, however, are drawn from small-sized pieces, not exceeding 4 by 4 in. cross-section. Large timbers require years of drying before the moisture is reduced to the point where strength begins to increase. More or less checking always occurs when large timbers dry, and if this checking is excessive it may cause enough weakness to counterbalance the strength gained by drying. Consequently it is not safe to assume that the average strength of large so called seasoned timbers is much greater than that of green or wet ones.

The fiber saturation point of a number of species has been determined. This point, which varies with conditions and species of wood, designates the percentage of water which will saturate the fibers of the wood. It has been found that, under normal conditions, wood fiber will absorb a definite amount of moisture; additional water simply fills the pores of the wood. Only that water which permeates the wood fiber has an influence upon strength. For the following species, the saturation point occurs at the given percentage of moisture based on the dry weight of the wood: Longleaf pine, 25; red spruce, 31; chestnut, 25; loblolly pine sapwood, 24; red gum, 25; red fir, 23; white ash, 20.5; Norway pine, 30; Western tamarack, 30 per cent.

Prolonged soaking in cold water does not reduce the strength of green wood below that at its fiber saturation point, provided it remains in perfect condition. When wood has been dried and is re-soaked, it becomes slightly weaker than when green.

Wood soaked in heated water absorbs more moisture. This causes a reduction in strength and stiffness, as is seen in wood steamed for bending.

The Priest Lake Mining District, Idaho

BY WILLIAM M. COURTIS*

A coming copper district, that in a few years will have to be taken into the calculations, is that of Upper Priest river, Idaho. It is now reached by stage running every other day from Priest River Station on the Great Northern R. R., 25 miles to Williams, at the south end of the lake. A launch on the lake takes miners to their different trails; as yet there are no roads in the upper country. However, both roads and railroads can be easily built as the total rise in 60 miles to the mines is only about 700 ft. and the great falls of the Priest river would furnish power for an electric line, besides mills. Almost every claim has its own source of power near-by.

GEOLOGICAL CONDITIONS

The formation of this district is gray granite and schists, cut by diorite or diabase dikes, with interbedded dolomites. Quartz veins along the zones of action of the dikes, both fissure and interbedded, are a prominent feature. The schists and dolomites are very much altered along the contacts or near the dikes, where there are many quartz and calcspar veins, and ore impregnations. There is an immense amount of disseminated copper pyrites and galena, the latter especially near the lime contacts.

The surface ores are leached, but in a short distance come to the original form and judging by what little work has been done increase in grade, bornite coming in with the pyrites. The leaching and decomposition of the ore has made immense iron caps, especially at the Iron Horse group on Ploughboy mountain, belonging to the Gem Mining Company. At the State of Idaho group, at the lower Priest river, belonging to the Panhandle Mining Company, there is great deposit of iron, which at no great depth becomes pyrrhotite and chalcopyrite. Both of these locations have fine facilities for handling the ores on a large scale through deep adit tunnels, especially the Iron Horse group which occurs crossing a high ridge about 5000 ft. above the sea, the lake being at only 2400 ft. elevation.

CHARACTER OF THE ORES

The Idaho Continental is the nearest approach to a mine. This is on the east side of the Priest river, nearly to the Canadian boundary. It has several deep tunnels from 500 to over 1000 ft. long. The ore is mostly galena, sometimes massive but full of small separate quartz crystals so that the best ore would be improved by concentration. The quartz crystals are like plums in a pudding. The ore bodies are 4 or 5 ft. wide apparently solid galena and of large extent, making this mine one of great promise. The ore is selected and hauled out 25 miles to Port Hill. If the railroad comes up Priest river this mine can be worked better from the southwest side.

The galenas of this district are usually low in silver (10 to 60 oz.) but selections can be made running from 100 to 500 oz. Gold occurs with the ores to the amount of $1 up to $12. The lodes, or ore zones, are very wide. Under the present conditions $50 is put as the cost on the ore from mine to bullion. The following table gives some assays from various mines, copper being computed at 18.2c. per lb., lead at 5.8c., and silver at 65c. per ounce.

	Values per Ton in Dollars				
	Gold.	Silver.	Copper.	Lead.	Total.
Idaho { Pan Handle Claims } Co.....	Tr.	$ 0.31	$14.46	....	$14.77
Woodrat Co., aver'ge	$ 1.00	6.50	26.62	$19.11	53.23
Woodrat Co., copper	1.00	1.83	18.00	Nil.	21.75
Woodrat Co., galena	0.45	61.10	24.72	75.86	162.13
Cabinet Range Co...	12.40	16.19	22.50	Nil.	63.66
Cabinet Range Co...	6.20	1.33	23.19	Nil.	30.72
Kootenai Co.....	1.24	1.96	56.79	Nil.	60.00
Kootenai Co., concentrated 20:1.....	....	62.09	19.83	Undet.	81.92
Kootenai Co., concentrated 34:1.....	....	1.77	71.63	Nil.	73.40

Most of the properties are being developed by tunnels of no great length as the mountains are very steep. Some gold ore has been found, but the only mine that has reached the productive stage is the Farmer Jones, near Priest River Station. Rich specimens of free gold are shown from this mine.

It is a difficult country to prospect in on account of dense undergrowth and great timber product. Also horses will not live on the undergrowth, while the grassy meadows are few and mostly high up on the mountains, or along the river bottoms. The rock is very hard, making hand-work expensive.

Detroit companies have gone into this district, and are beginning to do systematic work.

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Roasting at the Golden Gate Mill

The condition of the gold in Mercur ore has been something of a puzzle to metallurgists. Sulphur and arsenic are present, and tellurium has been found, but no free gold. Silver, lead and copper are very small in quantity. Two classes of ore are found in the Consolidated Mercur's mines: about 42 per cent. of the entire output is sulphide ore, which requires roasting before it can be satisfactorily leached with cyanide; the remainder is oxidized, and requires only a preliminary crushing.

The sulphide ore is reduced to fist size in a crusher, and then in two successive rolls, to 10-mesh, when it is delivered to the roasters. The gold in the ore is found in minute cleavage planes and crevices, and is easily attacked by the cyanide solution, for which reason, crushing to this degree of fineness is required only for the sake of quick and complete roasting, and not for the purpose of facilitating the leaching.

The plant consists of coal-fired Jackling roasters, 125 ft. long by 12½ ft. wide. Each furnace consists of a single roasting hearth, whose roof serves as a cooling hearth. The ore is fed onto the lower level, and is moved continuously in one direction by travelling rabbles. Escaping from the end, it is elevated to the upper hearth, where it again travels the length of the furnace, exposed to the air. It is here lightly sprinkled with water, partly to cool it, but principally to slack the lime formed, during roasting, from the calcite in the ore, thus forestalling the heat and stresses that would occur if the lime came into contact with water for the first time in the leaching vats.

The ore occupies about four hours in roasting, and the same length of time in cooling. Its volatile components are reduced from 5 per cent. sulphur, and 4 to 6 per cent. arsenic, in the raw state, to 0.6 per cent. sulphur and 0.8 per cent. arsenic in the roasted ore. The roasted ore has sometimes been washed with water, to extract soluble salts, before passing to the leaching vats. Oxidized and sulphide ores from the mine are kept apart until they reach the vats.

During the year ending June 30, 1906, four roasters were in operation for 46 days, five roasters for 237 days, and six roasters for 82 days. The total number of roaster days was, therefore, 1861. As 126,358 tons of sulphide ore were treated, the average work was 68 tons per roaster per day. The operating costs, including maintenance and repairs, for the year, were as follows:

	Total.	Per Ton.
Coal.....	$73,759	$0.583
Labor.....	33,736	0.267
Power and other items...	18,544	0.146
Total.....	$126 039	$0.996

They burn slack coal, which costs $5.25 per ton, delivered. The labor consists largely of firemen, who receive $2.75 for eight hours.

There are two large gold extraction works at Colorado City, Colo., both belonging to the United States Reduction and Refining Company, and treating ore from Cripple Creek. These were originally chlorination plants, but now they can scarcely be considered as such alone, inasmuch as the tailings from the chlorination department have been, for a long time, concentrated on tables, and now plans are being carried out for further treatment of the tailings from the tables by cyanidation. Consequently the practice will soon comprise a triple treatment.

MINE TIMBERING AT LAKE SUPERIOR

A Discussion of the Application of Various Systems

BY W. R. CRANE*

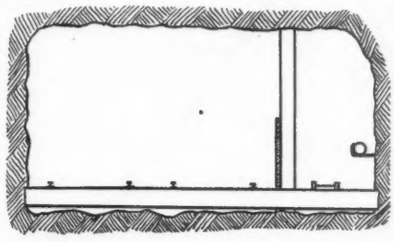
Much timbering is done in the copper mines of northern Michigan, although in many of them the use of timber is confined almost exclusively to the shafts, pillars being depended upon for support of the hanging wall in the stopes. The problem of support of workings several thousand feet distant, vertically, below the surface is becoming more difficult of solution with the lapse of time, owing to the rapidly increasing area of workings only partially supported, and to a less extent to the collapse of the supports, pillars or timber in the upper levels. The enormous loads thrown upon the hanging walls of large open stopes, which are supported by pillars or timbers of only a very small proportionate part of the total area exposed, must ultimately cause their disintegration, which, when it occurs, may start a movement that may be very slight, yet the results would be difficult to conjecture.

Where portions of the vein filling are left for support of hanging wall, the idea is to remove ultimately as much of it as possible before it collapses and before any fall of roof would interfere with the operations carried on below. No systematic attempt has been made to rob pillars, except in the filling system, in which case those left standing and finally removed are the floor or chain pillars. That none too large pillars are left for the support of the hanging wall is evidenced by the rapid breaking up of such unmined portions, and that, too, in the course of but a few years.

Timbering may be used as an auxiliary to pillars and alone, even, as temporary support, and is in fact employed extensively both ways. Probably mine support by timbering is carried on most extensively and systematically in the Calumet & Hecla and the Tamarack mines, which are among the largest and deepest in the district. It would seem, after the disturbances which have recently occurred in several of the mines of this district, that ultimately filling of the stopes with waste must be the solution of the problem of support. No attempt is made in this connection to give details of all of the forms of timbering employed, but rather to make note of only a few typical forms which have come under our observation.

TIMBERING IN SHAFTS

The method of sinking practically all of the shafts through the surface materials, which are usually sands and gravels, is by drop shafts, consisting of frames and studdles forming sets, to which additions can be made indefinitely. These sets when securely bound together by bolts and inclosed in a sheathing of lagging maintain the shape and alinement of the shaft and keep out any quicksand that might enter otherwise. Below the point where the surface materials terminate, and where the shafts enter solid rock, often



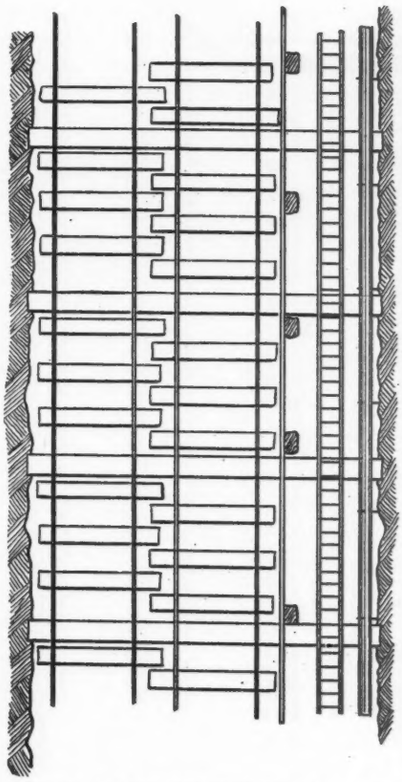


FIG. 1. (PLAN AND SECTION OF SHAFT) METHOD OF SHAFT TIMBERING

no timbering is necessary, for a time at least, the excavation being self supporting.

The arrangement of the timbering used in self-supporting excavations is shown in Fig. 1. The long sleepers, running transversely with the shaft, are set in hitches cut in the sides of the shaft, and are carefully alined with the finished portion. Timbering in this manner is done in reverse order to shaft sinking, i.e., is carried on from below upward, the object being to facilitate matters. Timbers are placed up to the rock pentice, which is left as a protection to the operations in the shaft below, and when it is removed, only a few pieces of timber remain to be put in place to complete the support of the tracks, ladders, etc. The alinement of sleepers placed in this manner is rendered considerably more difficult than if carried downward continuously from the finished shaft above, the work of alinement having to be carried on through the small sinking shaft and to a point 100 ft. below the end of the working portion.

The sleepers having been placed and securely wedged in position, the ties are next put in position, being set alternately with ends overlapping. The sleepers are 12 in. x 12 in. x 17 ft. 8 in. and are spaced 8 ft. apart, center to center. There are six 7x8-in. or 7x10-in. ties placed between two adjacent sleepers. A partition 4 ft. high separates the hoisting compartments from the manway, which is 4 ft. wide. Posts (10x10 in.), set between the foot and hanging walls, support the 2-in. planking

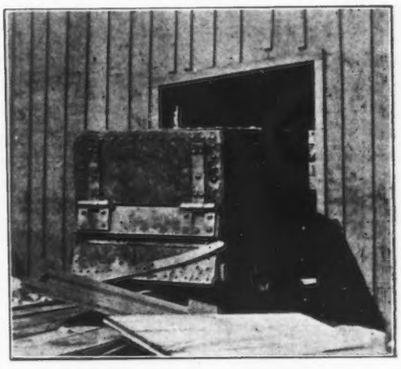


FIG. 2. SKIP FOR FILLING AND BALLASTERING SHAFT TRACKS

of the partition, which serves as a protection against falling rock to men passing up and down in the manway. Wooden ladders are fastened to the sleepers as shown in Fig. 1.

On the up-shaft side of the sleepers are fastened planks, which extend from the top of the sleepers to the bottom of the shaft excavation, thus dividing that portion of the shaft flush with the tops of the sleepers and ties into sections or pockets, as it were, by the plank dams. These sections are filled with fine mine dirt, the placing of the dirt being accomplished by a small skip of about two tons capacity, which is provided with a small gate at the lower part of the rear end, Fig. 2. A load of dirt is hoisted to the point in the shaft desired and the gate is opened by simply unlatching it, when the dirt runs out and is spread largely by gravity.

CONCRETE LINING

When the shaft excavation is not self supporting, the framing employed in the quicksand and other surface materials, or similar forms, is resorted to, usually,

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however, without lagging. Aside from timbering, concrete linings are occasionally employed, which reach from the surface to bed rock, with which connection is made, thus effectively shutting off the passing through plates in the body of the structure.

TIMBERING IN DRIFTS AND STOPES

In the workings, i.e., levels and stopes, timbering takes the form of stulls and

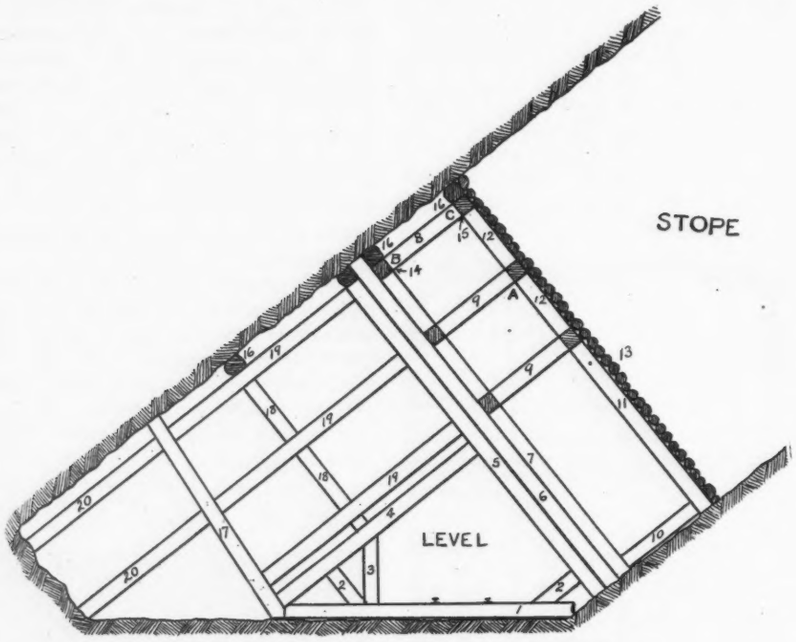

FIG. 3. LEVEL TIMBERING AND SQUARE SETTING

1—Sill
2—Foot Kene
3—Hanging Knee
4—Post
5—Stull
6—Filler
7—Starter
8—Hanging Post
9—Center Post
10—Studdle
11—Leg
12—Double Ender
13—Lagging
14—Bottom Wall Place
15—Wall Plate
16—Blocking
17—Stull
18—Post or Strut
19—Flat Cap
20—Props

used in combination with individual stulls. Stull timbers range in size from 1 to 4 ft. in diameter. They are carefully measured and cut on the surface, are then carried below and set normal to the lode, being wedged fast.

The arrangement of timbers employed in levels, which serves as a basis for the building of square sets in stopes, is shown in Fig. 3. Further, square setting may be stopped at any time and the face of the timbering covered with lagging as shown. One form of square-set joining is shown in Fig. 4. The forms of the individual members are shown in three projections each, from 1 to 6, while in 7 is shown a combination of 1, 2 and 3 (a joint for a standard set) and in 8 are grouped 5 and 6 and a form of 3. The arrangement of timbers shown in 7 is a plan of the joint at *A*, Fig. 3, while in 8 is shown a plan of the joint *B*. The blind double ender No. 4 is used with 2 and 3 in joint at *C*. In 7 and 8 the dotted lines represent the members above and below the plane of the plan given, always similar, but not necessarily vertical.

Timber caps, or wall pieces, usually rough round logs, are also employed, being supported by pack walls built along the lines of the levels. A lagging of rough poles is placed on the caps and waste rock piled on these in turn. Levels are thus formed and maintained in the Baltic and Trimountain mines, where filling methods are employed; often as much as 30 to 50 ft. of waste filling may rest upon the caps.

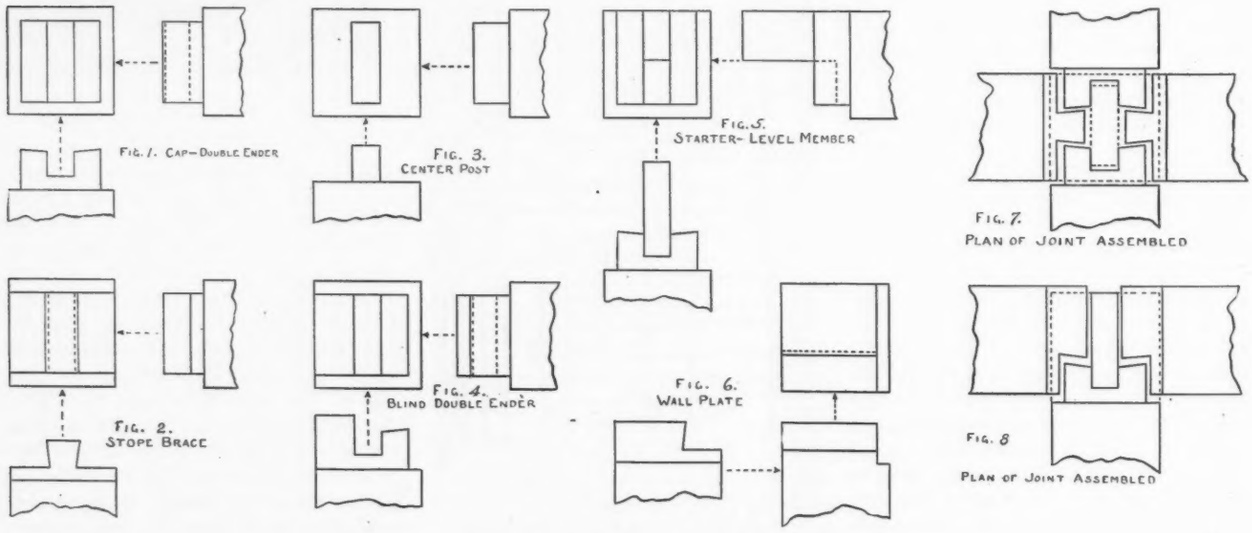
FIG. 1. CAP—DOUBLE ENDER
FIG. 3. CENTER POST
FIG. 5. STARTER- LEVEL MEMBER
FIG. 7. PLAN OF JOINT ASSEMBLED
FIG. 2. STOPE BRACE
FIG. 4. BLIND DOUBLE ENDER
FIG. 6. WALL PLATE
FIG. 8 PLAN OF JOINT ASSEMBLED

FIG. 4. FORMS OF SQUARE SET JOINTS

water that is often encountered in large quantities in the loose surface accumulations of gravel and sand. Concrete is also used in the rock excavation of shafts, where it serves as support for the tracks, being built either in transverse ties or longitudinal stringers for the rails to rest upon and be fastened to by long bolts

square sets, and all imaginable combinations of the two. In the deeper levels of the Tamarack mines, stulls, both in the form of individual members and in groups of three or four, set close together (commonly known as batteries of stulls), are extensively employed. The batteries are spaced from 8 to 10 ft. apart and may be

Timber as a means of support for the mines has a wide range of usefulness in this district and will always be an important factor in mining regardless of the methods employed.

A blue pigment suitable for dyeing silk can be prepared from the metal molybdenum.

THE GENESIS OF MINERAL WATERS*

A Discussion of Their Relations to Volcanic Action and the Formation of Ore Deposits

BY ETIENNE A. RITTER †

The celebrated member of the French Academy of Sciences, Armand Gautier, does not accept unreservedly either the theory of surface descending waters reaching the belt of cementation by a thousand small fissures and coming up from it through a few large channels as hot ascending waters, as ably developed by Professor Van Hise, or the theory of the formation of newborn or juvenile magmatic waters, as given by Prof. Edward Suess, who thinks that the main fault-planes, and specially the volcanic chimneys, are the channels through which gaseous sulphur, hydrocarbons and hydrogen come up from the interior of the earth. In a belt close to the surface these compounds are oxidized and they are transformed into sulphurous and sulphuric gases, carbon dioxide and water.

According to Mr. Gautier, the water of the hot springs is expelled as such from the eruptive rocks, at great depth, by a process of "distillation" of these rocks, which he explains at length. The process of distillation of the eruptive rocks is the kernel of Mr. Gautier's theory.

His pamphlet is divided into two main parts. In the first part he shows that the genesis of volcanic eruptions and the genesis of thermal springs are closely connected. In the second part he studies the process which gives rise to the hot springs and the eruptions. Mr. Gautier begins by giving many examples demonstrating that the formation of hot springs is nothing but a manifestation of the volcanic activity at the period of its decrease. Other examples have been gathered to prove that the volcanic activity is due primarily to the descent into the central liquid magma of the earth of large blocks of the earth crust. These two theories have been discussed before, often and ably, and I believe that they are admitted today by the majority of geologists.

It is in the relations between the fall in depth of these blocks of the earth crust, the volcanic action and the production of the hot springs that Mr. Gautier's investigations bring new facts to bear on the problem.

Mr. Gautier has found by numerous experiments in his laboratory that in heating to redness in a vacuum the powders from granites, porphyries, trachytes, gneiss, gabbros, etc., a large amount of water and of gases is expelled. Carbon dioxide and hydrogen are the two most important among the gases. All the possible moisture had been previously expelled in heating the powder in a vacuum, at a temperature of 150 to 200 deg. C. The water, which can be expelled only in heating the rock powder at from 450 to 500 deg. C. in a vacuum, is really a constituent part of the rock itself. The following numbers were obtained experimentally:

LOSS OF WATER IN A VACUUM, FOR 1 KG. OF ROCK.

	From 15° t. 200°.	From 200° to red heat
Granite of Vire.....	2.29 grams.	7.35 grams.
Porphyry of the Esterel	5 80 "	12 40 "
Ophite of Villefranque	.....	15.06 "
Lherzolite of Lherz....	.....	16.80 "

At the same time the pulverized rock, freed from any volatile constituents by being heated to 200 deg. in a vacuum before the operation, gave from 3 to 18 times its volume of new gases. The gases appear a little before the red heat, or at the red heat. A fact of the utmost importance is that these gases are the same as those expelled by volcanoes, as the following table shows:

GASES FROM THE ROCKS COMPARED WITH GASES FROM THE VOLCANOES

	Gases from the Rocks.				Gases from the Volcanoes	
	Granite of Vire (Gautier)	Porphyry of Esterel (Gautier)	Ophite of Villefranque (Gautier)	Gneiss of Seringapatoun (Tilden)	Pelee Mt. (Moissan)	Santorin (Fouque)
Free hydrogen.....	77.30	31.00	56.29	61.9	22 3	16.13
Carbon dioxide and carbon oxy-sulphide.....	14 80	59.15	35.71	31.6	44 20	50.41
Carbonic oxide.....	4.93	4 20	4.85	5.4	4.50	....
Methane	2.25	2.53	1.99	0.5	15.7	2.95
Hydrocarbons not saturated	0.0	0.0	0.0	0.0	0 0	0.0
Sulphureted hydrogen.....	traces	0.0	0.45	0.0	0.0	traces
Nitrogen and argon.....	0.83	2.10	0.68	1.6	12.20	30 32
Ammonia.....	traces	traces	traces	....	traces	traces

It is easy to calculate the amount of gases and of water which would be expelled when a cubic kilometer of granite (1,300,000,000 cu.yd.), in falling deeper into the liquid central magma, would have its temperature increased from below 400 to above 500 deg. Centigrade.

For the granite, the rock which expels the smallest amount of water, the amount thus liberated would be from 25 million to 30 million tons of water. As steam, that water would occupy a volume equal to 43 billion cubic meters (56 billion cu. yd.) at a temperature of 100 deg. C., and at the temperature of 1100 deg. C., 160 billion cubic meters; and at the same temperature the various other gases expelled besides the water would occupy a volume of 28 billion cubic meters.

The result would be a minimum pressure of 7000 atmospheres. The temperature of 1100 deg. C. is the average temperature of the lavas taken when they flow from the crater. Some eruptive rocks melt only at temperatures of from 1200 to 1300 deg. C. According to the law of increase of temperature in depth, these lavas should come from a depth of 35,000 to 40,000 meters below the crater. It would require a pressure of about 8000 atmospheres for raising up such a column of water, and it is very interesting to remark that such is the pressure furnished by the water and the gases expelled from the eruptive rocks.

It is a well known geological fact that faults of more than 3000 ft. of downthrow have been observed in numerous instances. Mr. Fouque has shown, on the other hand, that the eruption of Mt. Etna in 1865, lasting 200 days, threw out more than two million tons of water. That would correspond to the water expelled from less than a quarter of a cubic kilometer of rock.

Mr. Gautier thinks that there is a zone where slight variations of temperature oblige the rock to give up its water of constitution very slowly, and that the newborn water, as well as the water obtained by the oxidation of the hydrogen liberated at the same time, will come up slowly and reach the surface as a small continuous stream, forming a hot spring. His experiments have shown that if the gases liberated when the rock is heated above 500 deg. C. are all taken out, and if afterward some steam is introduced, new and similar gases are formed by the action of the steam on the ferrous salts which exist in almost every kind of rock. Any ferrous salt, in presence of steam at 500 deg. C., gives ferric or ferroso-ferric salts and hydrogen in accordance with the two following equations:

$3\,FeS + 4\,H_2O = Fe_3O_4 + 3\,H_2S + H_2$

and $H_2S = H_2 + S$ (when heated above a red heat).

The same reaction happens with metal-

*A summary of a paper by Armand Gautier in *Annales des Mines*, Xth serie, vol. IX, 3d liv., 1906, pp. 316-370.

†Mining engineer, Colorado Springs, Colo.

lic sulphides, but only when silica or silicates are present.

$$PbS + H_2O + SiO_2 = PbSiO_3 + H_2 + S$$

It explains how sulphur is freed in depth. Beginning at the dull, red heat, steam reacts on the ferro-magnesian and ferro-calcic minerals, such as olivine, hornblende, pyroxene, hyalosiderite, hypersthene, diallage, etc., thus explaining the formation of the magnetite found in the eruptive rocks.

$$9\,SiO_3Fe + 4\,H_2O = 3\,(SiO_3)_3Fe_2 + Fe_3O_4 + H_2$$

Normal ferrous silicate. Ferric silicate. Magnetite.

The water cannot exist together with the metallic masses rich in iron. But hydrogen takes the oxygen from all the oxides, even the carbon dioxide, at red heat, by the reaction $CO_2 + H_2 = CO + H_2O$, as has been found experimentally. Carbon monoxide combines with S and gives the oxysulphide of carbon, COS, and nearer the surface the following reaction:

$$COS + H_2O = CO_2 + H_2S$$

which explains the genesis of carbon dioxide and of sulphureted hydrogen among the volcanic gases. Another reaction likely to occur is

$$3\,CFe_2 + Fe_2O_3 = 3\,CO + 8\,Fe$$

or

$$CFe_2 + CO_2 = 2\,CO + Fe_2$$

The metallic carbides and nitrides, when they are oxidized, give carbon dioxide, water, methane and hydrocarbons; all these products have been obtained experimentally in heating the powder of eruptive rocks above 500 deg. C., as well as in the gases ejected during volcanic eruptions.

The two following reactions occur also:

$$2\,Fe_2O_3 + 6\,H_2S = 4\,FeS + 2\,H_2O + 2\,SO_2 + 4\,H_2$$

and

$$2\,H_2O + H_2S = SO_2 + H_6$$

All these reactions have been obtained experimentally, and they show the transformation of the sulphides into oxides, and how the hydrogen, the sulphureted hydrogen, the sulphurous gas, steam and carbon dioxide are obtained, as well as the sulphur, found in such large amounts in the solfataras. It is a remarkable fact that all these reactions occur in spite of the complete lack of free oxygen, an element which was thought to have been requisite for the success of the reactions, until Mr. Gautier's experiments proved that such was not the case.

Sodium chloride is one of the main volatiles ejected by volcanoes, and it plays an important part in the bringing up of the metals to the surface. At the high temperatures obtained, the reaction is

$$PbS + H_2O + 2\,NaCl + SiO_2 = SiO_3Na_2 + PbCl_2 + H_2 + S$$

until the chlorides reach a zone where they are dissolved by the newborn waters, and are then transformed into silicates, carbonates and sulphides by various reactions.

It is because the chlorides of tin, titanium and antimony are the most volatile, that their genesis by pneumatolitic action remains so plainly visible in their ores. They occur in the ores as oxides, such as cassiterite or rutile, or as sulphides, such as stibnite, according as the steam or the sulphureted hydrogen was in greater abundance in conjunction with the gaseous chlorides.

The metallic sulphides can form silicates by the reaction

$$2\,KCl + SiO_2 + H_2O = SiO_3K_2 + 2\,HCl$$

and as they are only slightly soluble in water, they form the ore deposits of an aqueous origin. Nevertheless, it is only as chlorides that they could have come up.

The metallic sulphides at a red heat, and with steam, give oxides, and silicates when free silica is present, with the formation of hydrochloric acid gas, and of sulphureted hydrogen, as it is shown by the following reaction, for the case of the iron, for instance:

$$FeS + 2\,KCl + 2\,SiO_2 + 2\,H_2O = SiO_3K_2, SiO_3Fe + 2\,HCl + H_2S$$

This is the most probable genesis of the minerals in the primitive rocks, and it is doubtless the way in which the feldspars, the pyroxenes, the amphiboles and the peridots have been formed, and also the micas, if the fluorides were also present, together with the chlorides.

The following reaction is the most probable for explaining the genesis of the quartz, and also of the nitrogen and ammonia ejected by the volcanoes, and also found in almost all thermal waters:

$$Si_2N_8 + 4\,H_2O = 2\,SiO_2 + 2\,NH_3 + N + H_2 = 2\,SiO_2 + 3\,N + H_8$$

The following analyses show the complete similarity of sulphurous waters, artificially obtained in heating granite powder to 300 deg., and the natural sulphurous springs:

	Sulphurous Waters from the Granite.		Natural Waters from Thermal Springs.	
	I.	II.	Barèges.	Bagnères-de-Luchon.
Sodium sulphide	0.108 grams	0.210 grams	0 042 grams	0.054 grams
Potassium sulphide	trace	trace	trace	trace
Various silicates	small quantity	small quantity	not taken	0.038
Salts of Fe, Mg, Ca	....	...	0.045	0 119
Free sulphureted hydrogen	4.3 c c.	9.4 c.c.	....	trace
Carbon dioxide	6.8 c.c.	....	....	trace
Nitrogen and argon	2 3 c.c.	not taken	4 c.c.	not taken
Ammonia and organic matter	trace	trace	trace	0.038
Free silica	trace	trace	trace	trace

A point worthy of note is that in the artificial waters the sodium sulphide is formed in spite of the fact that it does not exist in a free state in the rocks, while they contain only a trace of the potassium sulphide, which was contained as inclusions in the rock in fair amount. Such a result can be explained only by the following reactions:

$$2\,NaCl + SiO_2 + H_2O = SiO_3Na_2 + 2\,HCl$$

then

$$SiO_3Na_2 + 3\,H_2S = SiS_2Na_2S + 3\,H_2O$$

and

$$SiS_2Na_2S + (SiO_2)_3Al_2O_3 = SiS_2Na_2S\text{-}(SiO_2)_3\,Al_2O_3,$$

which later on by decomposition will give up its sodium sulphide. That allows us to understand why all the natural sulphurous waters are almost exclusively sodic, in spite of the fact that they come out from rocks rich in potassium and poor in sodium, and why in these thermal waters the free sulphur exists only in very small amounts.

Mr. Gautier emphasizes the tremendous amount of carbon dioxide continuously expelled from the interior of the earth, and he shows that the same remark applies also with truth to the case of the hydrogen, the most abundantly emitted gas from the interior of the earth after the carbon dioxide. He has proved by his experiments that hydrogen is always and everywhere found at the surface of the earth. At the same time this gas is never found in the upper regions of the atmosphere, where it should accumulate on account of its light density. The explanation of the lack of hydrogen high in the atmosphere is that it slowly combines with the oxygen of the air into water, under the influence of the solar rays. It follows that its abundance at the surface of the earth, as well as its continuous transformation into water, as it goes up into the atmosphere, can be explained only by a continuous output of the gas from the interior of the earth.

The thermal springs give not only these two important gases, the carbon dioxide and the hydrogen, but they furnish also all the volcanic gases, such as sulphureted hydrogen, methane and oxysulphide of carbon. Among the volcanic gases emitted by the thermal springs in large amounts is nitrogen, with its satellites, argon, neon, and helion. It is through the thermal springs that the most inaccessible metals stored by nature in the interior of the earth—from uranium to helium—come up into the atmosphere and under our direct observation.

Arsenic is used in the form of arsenious acid, for preserving the skins of animals and birds in museums.

THE REHABILITATION OF HYDRAULIC MINING

Steps Now in Progress to Restore California's Gold-Washing Industry to Its Former Importance, Without Interfering with Agriculture

BY J. P. HUTCHINS *

For the past 25 years hydraulic mining has been carried on in a way most unsatisfactory to all interested in it. After it had been checked by injunctions in 1880 there was a period, until after the passage of the Caminetti act in 1893, during which the mines were unworked, and the consequence was disastrous to numerous interests. Not only were mine owners affected, but also all the residents of the mining districts, and to a more or less extent of the whole State.

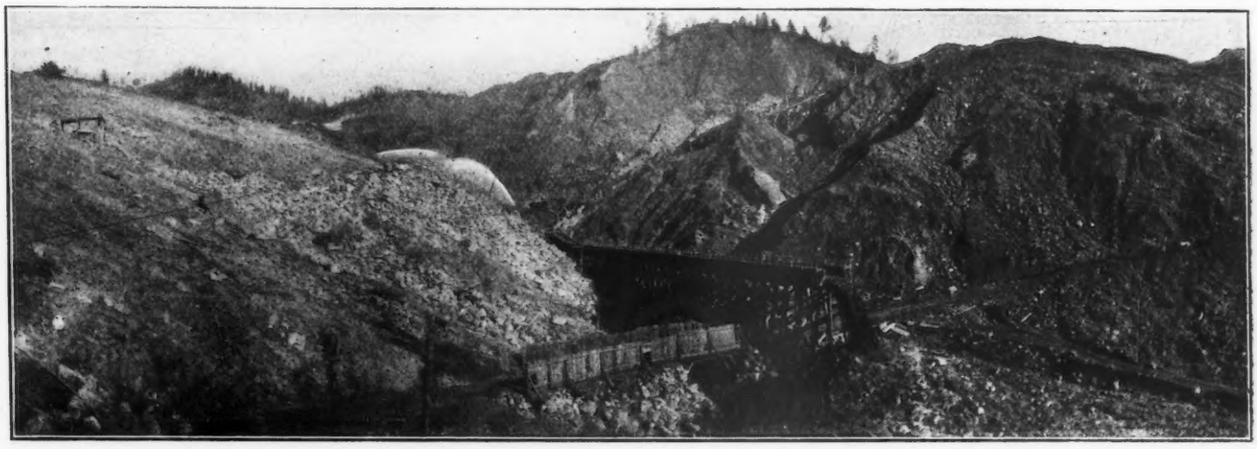

FIG. 1. GENERAL VIEW, LA GRANGE MINE

FIG. 2. HYDRAULIC STREAMS AT LA GRANGE MINE

PLAN FOR REHABILITATION

This, briefly stated, is as follows: Barriers are to be built where the rivers debouch from the foothills of the Sierra Nevada mountains. These dams are to have a double function: (1) They will impound the débris; (2) they will also act as diverting dams, turning the water of the rivers into canals of various types. These canals will also act in double capacity: (1) They will conduct the silt-laden water to fill in the low marshy area of the valley district; (2) they will serve as sluices, i.e., they will be paved with gold-saving devices of various types. It is also planned to use some of the water for irrigation, there being much land which would be greatly improved by irrigation with muddy water; the material in suspension is fine soil particles of great richness.

VAST QUANTITY OF GRAVEL AVAILABLE

The successful fulfilment of the plan will mean much for California, affecting favorably all interests directly or indirectly. There are probably 1,000,000,000 cu.yd. of gravel workable by the hydraulic process on the west flanks of the Sierra Nevada mountains. This enormous volume of material, which equals a prism one mile square and about 1000 ft. high, has a savable content of between 10c. and 40c. per cubic yard, probably an average of about 20c., or a total of about $200,000,000. This vast amount of gold is awaiting extraction, and it will be mined rapidly if the miners are allowed to work. More than 50 per cent. of it will be disbursed for operating expenses.

Of the total operating expenditure about half will result in adding fertility to the soil.

There are wide expanses of marsh in the total 1700 sq. miles annually flooded, now waste and practically worthless, but capable of conversion into extremely rich farming land, by reclamation with silt from the hydraulic mines. Much of this area was waste long before the discovery of gold in California. Mining and farming served to aggravate conditions already bad, such as are usually encountered on the flood plains of rivers. Such ground now commands, in many instances, prices less than $1 per acre; when reclaimed, its fertility will make it worth

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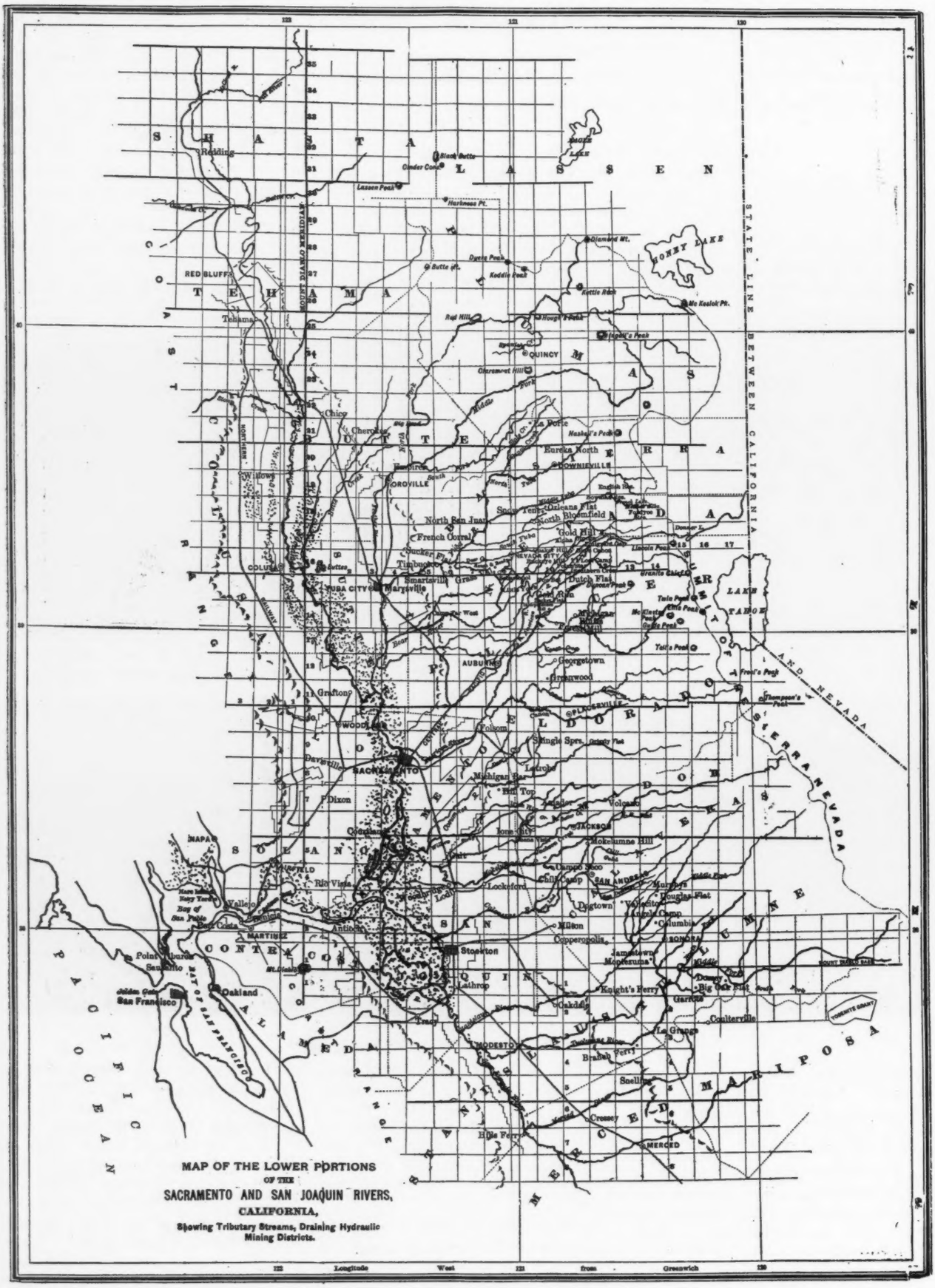

SHASTA
LASSEN
TEHAMA
PLUMAS
SIERRA
BUTTE
GLENN
COLUSA
YUBA
SUTTER
YOLO
NEVADA
PLACER
EL DORADO
SACRAMENTO
SAN JOAQUIN
AMADOR
CALAVERAS
NAPA
SOLANO
CONTRA COSTA
ALAMEDA
STANISLAUS
TUOLUMNE
MARIPOSA
MERCED
STATE LINE BETWEEN CALIFORNIA AND NEVADA
RED BLUFF
Redding
Tehama
Chico
Oroville
Marysville
Smartsville
North San Juan
French Corral
Nevada City
Grass Valley
Dutch Flat
Gold Hill
Bloomfield
Eureka North
Downieville
Graniteville
Georgetown
Greenwood
Folsom
Shingle Spgs.
Latrobe
Michigan Bar
Fiddletown
Volcano
Jackson
Mokelumne Hill
Jones City
Lockeford
Valley Springs
Douglas Flat
Columbia
Sonora
Stockton
Lathrop
Oakdale
Knight's Ferry
Garrote
Coulterville
La Grange
Modesto
Snelling
Crocker
Hills Ferry
Dixon
Vacaville
Rio Vista
Vallejo
Benicia
Martinez
Antioch
Point Pinole
San Pablo
Oakland
San Francisco
Golden Gate
Bay of San Pablo
Suisun Bay
Carquinez Strait
Mare Island
Napa
Sonoma
Lassen Peak
Black Butte
Cinder Cone
Hat Creek
Pit River
Harbison Pt.
Diamond Mt.
Honey Lake
Dyer Mt.
Butte Pk.
Kettle Rock
Mt. Kaslok Pk.
Red Hill
Hough's Peak
Spencer Pk.
Quincy
Chromo Hill
Middle Fork
Feather River
Nash's Peak
Big Bend
Cherokee
Round Valley
Indian Creek
Big Meadows
Willows
Orleans Flat
Snow Tent
Buckeye Hill
Tinbuckets
Grass Valley
Nevada City
Gold Run
Dutch Flat
Alpha
Omega
Placerville
Coloma
Lotus
Georgetown
Greenwood
Auburn
Folsom
Shingle Springs

over $100 per acre. Restored fertility to land made unproductive by too intensive cultivation has often been the result of flooding with silt-laden water—as, for example, along the Nile. Then, too, the elevation of the rivers in their channels causes a rise in the sub-soil water level of the adjacent land, making it moist and tillable.

PREVENTION OF FLOODS

An important consideration which has been generally overlooked is the prevention of freshets in valleys by conserving flood water in reservoirs, which will be built in the high mountains, to supply water during the dry season. The extensive construction of these, if hydraulic mining shall be resumed, will tend to prevent the recurrence of such catastrophes as sometimes happen in California in the spring, when warm rains, following a heavy snowfall, cause disastrous floods on the plains of the Sacramento and San Joaquin rivers. In this way hydraulic mining will have a directly beneficial result.

RIVER IMPROVEMENT

An essential, though not strongly emphasized, part of the plan is the contemplated improvement of the rivers by giving them wider channels and better gradients and making them more easily navigable. Like all rivers flowing through flood plains, those of California follow meandering courses, which increase the river length and proportionately decrease the gradient. Sloughs, which are in some cases former channels of the rivers, have often been closed by levees to protect farms from inundation. A short-sighted policy has sometimes built these levees where they have further narrowed an already insufficient channel area and raised the flood plain. For this result the farmers usually blame hydraulic mining, whereas they are themselves largely responsible.

It is planned to straighten the rivers and systematize the building of levees. This procedure will do much to correct bad conditions. A straight channel will have a steeper gradient and the increase scour will deepen it so that the flood plain will be greatly lowered, navigability will be improved, and a cause of enmity between miner, steamboatman and farmer will be removed.

DIFFICULTIES OF MAINTAINING LEVEES

Filling in the low land with silt from the mines will raise it above the flood plain, and out of the danger zone; whereas the present system of levees gives the low ground a costly protection, hazardous at best. The levees constantly settle on their poor foundations and must be raised from time to time. Clam-shell dredges have been used in this work and the material from the river bed, adjacent to the bank, has been excavated for this purpose. In several instances, this work has been carried on until the river bed, close to the banks, has been dredged to hard-pan; for this reason, dredges with longer booms, some 150 ft. long, have been installed to permit the excavation of the river bed at a greater distance from the banks.

This latter fact is interesting from several aspects; first, it would appear that after a time, if the method now in vogue is pursued, it will be difficult, if not impossible, to continue leveeing; second, the two circumstances that the former excavations have not filled up and that it has been necessary to build dredges with longer reach indicate that the amount of sediment transported by the rivers has been greatly exaggerated. In some testimony, elicited at the time injunctions were granted to close the hydraulic mines, appear statements to the effect that, in ad-

FIG. 4. 8-INCH STREAM PLAYING 400 FEET HORIZONTALLY

FIG. 5. EFFECT OF PLAYING ON A BOULDER

dition to the silt in suspension in the rivers, an amount equivalent to 4 per cent. of the total volume of the rivers was rolled along the bottom. It is largely due to such false testimony that injunctions have been granted and mines shut down.

Fig. 1 is a general view of La Grange mine, in Trinity county, Cal.; about 10,000 cu.yd. per day is hydraulicked. This mine dumps into the Trinity river, an affluent of the Klamath, and thus has no débris difficulties. An unusual feature of this mine is the use of machine air drills in blasting large boulders.

Fig. 2 depicts three streams in operation with an aggregate flow of about 70 to 80 sec. feet.

Fig. 3 is a map of part of California (reproduced with some modifications from Bowie's "A Practical Treatise on Hydraulic Mining in California," published by D. Van Nostrand Company, New York). It depicts the regions containing the hydraulic mines which discharge tailing into streams drawing the water-sheds of the Sacramento and San Joaquin rivers. The distance from some of the mines, notably those near Marysville, is only about 20 miles from the farms and orchards of the valley. This condition and the topographic features, which conduced to a rapid transport of fine tailing to the lower rivers, resulted in débris difficulties near Marysville. The dotted areas are marsh lands, some of which have been reclaimed by levees. The channels shown on the map are but a few of the network of sloughs that traverse the marsh lands.

Fig. 4 shows one of the streams elevated so as to show its trajectory. The water is being projected through an 8-in. nozzle to a distance about 400 ft., although the nozzle is not elevated so as to give a maximum length of trajectory. Fig. 5 illustrates the same stream turned against a large boulder; the water is splashing nearly 100 ft. high; when in bright sunlight such a spray produces a remarkable display of prismatic colors. Fig. 6 is a view of the sluice; it is 6 ft. wide, 4 ft. deep and is paved with T-trails laid transversely. Boulders weighing more than 1000 lb. are frequently run through the sluice.

Fig. 7 gives a general idea of the topography in northern California, where hydraulicking is carried on most successfully. A stream is seen at work in the right background.

(*To be continued.*)

Concrete Lining for Shafts

A new departure in lining colliery shafts with concrete has been made at the Wilhelm shaft of the Koenig colliery, in the Saar district of Germany, the ferro-concrete lining extending over a depth of 470 ft. The ferro-concrete plates are 9½ in. thick, and are backed with rammed concrete, the plates on the longer sides of the rectangular shaft being strengthened by two 6-in. ribs. The iron rods, ⅝ in. in diameter, are inserted horizontally in the concrete, 4 in. apart, or closer together in the places where pressure is anticipated, while 24 rods are disposed at regular intervals all round the shaft. The corners are strengthened with angle irons, 2x2 in. In the cross-walls for supporting the cage guides, the horizontal and vertical rods are arranged in pairs at intervals of 11 in., and fastened together to form a skeleton. The guides are carried on H-girders, riveted to iron plates 12x6½ in., which in turn are bolted to the guides. The concrete is compounded of one part portland cement, 2½ of broken diorite and 1½ of sifted sand, and is firmed by ramming.

FIG. 6. SLUICE AT LA GRANGE MINE

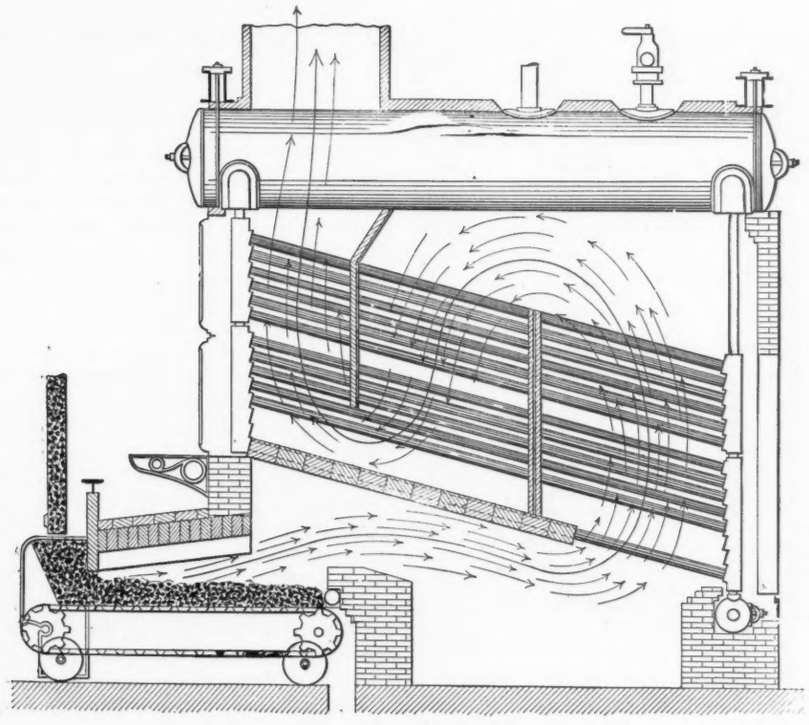
FIG. 7. TYPICAL TOPOGRAPHY OF TRINITY COUNTY, CALIFORNIA

THE SUPPRESSION OF SMOKE FROM STEAM BOILERS*

Discussion of a Problem of Wide Interest

BY A. BEMENT

The problem of burning bituminous coal without producing smoke can be divided into distinct features—one referring to legislation and its enforcement, the other to the technical or engineering phase of the matter, and it is more particularly the latter feature that is considered in this paper. It is my wish to emphasize certain fundamental principles upon which the complicated and difficult problem of smoke production and suppression rests, rather thatn attempt the detailed treatment of any individual condition or set of conditions.



SECTION SHOWING IDEAL BOILER ARRANGEMENT

It is a recognized fact that bituminous coal can be burned without smoke; also that the consumption of the volatile gases results in increased economy, and while great improvement has been made, there is very much still to be accomplished; and the great and foremost requirement is a technical one, demanding not only a recognition of the principles involved in smokeless combustion, but better engineering practice as affecting design of plants and furnace apparatus. I believe the people who are to blame for present conditions may be divided into three classes in the order of their responsibility:

First—Manufacturers of furnace apparatus.

Second—Consulting engineers and architects.

Third—Purchasers who operate the apparatus.

In considering the matter from the standpoint of manufacture, the important fact should be emphasized that with one possible exception there is, strictly speaking, no smokeless apparatus made. This single exception will be mentioned later; but it is first desirable to outline the requirements governing smokeless combustion. They are:

First—Uniform evolution of the volatile gas, which requires a stoker with a positively uniform feed of coal.

Second—The location of a chamber of sufficient length or capacity between the fire grate and exit to the boiler to insure that the volatile gases shall become thoroughly mixed with the air which enters with them.

Such chamber, which I have called a furnace, to distinguish it from the grate, must, of course, be made of refractory material to enable it to withstand the heat, and its walls necessarily become red hot; this has caused many people to believe that the high temperature in itself was the cause of the volatile gases being burned, failing to take into consideration the fact that the most important requirement is a thorough mixing of the gases with the air in the chamber. Failure to realize this fact has resulted in disappointment with many brick arches, "Dutch ovens," etc. The chain grate, owing to its feed of coal being on a horizontal line, insures a positively uniform rate in the feed, and consequently there is a steady evolution of the volatile gas, which will be burned if there is such furnace located between it and the boiler, and this apparatus may properly be called smoke proof, because it is impossible for the operator to either cause, or allow the coal to be fed in other than a steady and uniform manner.

Even when a very large furnace chamber is used with any form of stoker (other than a chain grate) or a hand-fired grate, a smokeless condition is dependent upon careful manipulation. For example, with a hand fire, if too much coal is added at one time, the evolution of gas will be greater than the mixing capacity of the chamber; or, with sloping grate stokers, when a large quantity of coal is poked or slides down the grate, the result is the same as when a large charge of coal is added to a hand fire. Thus the fuel-feeding apparatus or method of manipulation, must not overtax the mixing capacity of the furnace chamber, if a smokeless result is to be secured.

The accompanying illustration shows the latest and best type of smoke-proof steam generator, its furnace chamber being formed by tiles covering the lower row of the tubes of the boiler. It is not a patented apparatus and may be adopted by anyone who wishes to do so. In fact, many boiler plants now installed may at small expense be altered so as to conform to all of its essential requirements. While this particular improved apparatus has already been built when demanded by purchasers, no manufacturer is willing to erect it unless required to do so. The nearest approach to a smoke-proof apparatus in the form of a complete steam generator, offered by any maker, consists of a brick arch as an essential adjunct for the direction of the gases against the tubes of the boiler, and when this manufacturer installs a chain grate under this arch, it becomes the above mentioned exception to the rule. This does not mean, however, that a purchaser may not buy a boiler from one maker, a stoker from another, and with a little engineering produce an apparatus which is strictly smokeless, but that an entire apparatus of satisfactory character as a unit, cannot be purchased from any other manufacturer.

For a clearer understanding, it is essential that furnace apparatus be considered in two classes, one which is smoke proof, the other depending upon careful manipulation for good results. This latter class may also be separated into two divisions, those which by reasonably careful working will be smokeless, and others, which it is very difficult to operate without smoke.

*Abstract of a paper read before the Western Society of Engineers, Oct. 17, 1906.

Thus there are three grades of apparatus, the perfect, the moderately good and the bad.

The effort of health departments and smoke-inspection bureaus should be to enforce the adoption of the perfect apparatus, proper manipulation of the moderately good and the abandonment of the bad. Unfortunately, however, the most serious offenders—the manufacturers. consulting engineers and the architects—are not affected by the smoke laws, therefore can only be reached indirectly through the purchaser who bears all of the burden. Thus the only alternative is to enforce the laws in such manner as to be most effective.

The position of the smoke inspector from the engineering standpoint is a difficult one. As a general rule he is an administrative official, appointed or elected for the purpose of enforcing laws, and his time and efforts are taken up in such work, and the character of the requirements largely determines the training of the man selected. It necessarily follows that often he is not an engineer, at all events to that extent necessary for the solution of the difficult engineering problems encountered; the conditions under which he must necessarily work prevent to a very great extent his becoming technically proficient, because the tendency would then be for certain apparatus to be recommended in preference to others; this immediately results in trouble, caused by the influence of manufacturers who would not be favored. As it is, if a prospective purchaser applies to a smoke inspector for information as to the most desirable apparatus to be procured, he may be referred to a number of plants which are examples of good practice, in which he may find a variety of apparatus, and selecting one of these, often finds after it is in service, that under his conditions it is not satisfactory; upon further investigation, he discovers that others labor under as much difficulty as he, and thus often feels that he is an innocent victim of circumstances.

There are many plants where conditions render it difficult to correct the apparatus except at great expense. Such cases present a real problem to the smoke inspector. On the other hand there are many owners who do not try to improve conditions, in fact, make no effort to discover whether or not they can correct their practice or the apparatus, and make promises they do not intend to fulfil. One of the most common excuses is, that their boilers are "overloaded" and for this reason they can do nothing, and unless the inspector is an engineer and familiar with this phase of the matter, he often encounters a seemingly insurmountable difficulty, when in reality these same owners, for reasons of economy, would not work their boilers at a lesser capacity. As a matter of fact, the practice which insures a smokeless condition also results, as a general thing, in the production of a large capacity. The remedy with such owners is a drastic enforcement of the law.

In view of the fact that the greatest trouble is one that may be overcome by better engineering practice, and that there is no accepted or recognized independent source of information for the guidance of well intending purchasers, it is recommended that the various experiment stations connected with State universities and the different State Geological Surveys, present information to the people of their respective States, which, coming from such sources, would be accepted with confidence and used to advantage.

Mineral Output of California

State Mineralogist Lewis E. Aubury has issued the following table, showing the yield and value of mineral substances of California for the year 1905:

	Quantity.	Value.
Asbestos	112 tons.	$ 2,625
Asphalt	40,304 "	285 290
Bituminous rock	24,753 "	60,436
Borax	46,384 "	1,019, 58
Brick	286,618 M.	2,273,786
Cement	1,265,553 bbl.	1,7?1,916
Chrome ore	40 tons.	600
Clay	133,505 "	130,146
Coal	46,500 "	144,500
Copper	16,997,489 lb.	2,650,605
Fuller's earth	1,344 tons.	38,100
Gems	.....	148,500
Glass sand	9,257 tons.	8,121
Gold	.....	19,197,043
Granite	228.738 cu.ft.	353,837
Gypsum	12,850 tons.	54,500
Infusorial earth	3,000 "	15,000
Lead	533,680 lb.	25 083
Lime	616,995 bbl.	555,322
Limestone	192,749 tons.	323,325
Lithia mica	25 "	276
Macadam	1,440 455 "	942,503
Magnesite	3,933 "	16,221
Marble	73,303 cu.ft.	129,450
Mineral paint	754 tons.	4,025
Mineral water	2,194 180 gal.	538,700
Natural gas	148,345 M. cu.ft.	102,479
Paving blocks	3,408 M.	134,347
Petroleum	34,275,701 bbl.	9,007,820
Platinum	200 oz.	3 320
Pyrites	15,503 tons.	63,958
Quicksilver	24 655 flasks.	886,081
Rubble	1,183,802 tons.	774,267
Salt	77,118 "	141,925
Sandstone	302,813 cu.ft.	483,268
Silver	.....	678,494
Slate	4,000 squares.	40.000
Soapstone	300 tons.	3 000
Soda	15,000 "	22,500
Tungsten ore	52 "	18,800
Total value		$43,069,227

The total value of metallic substances, and ores was $23,523,984 and of non-metallic substances, $2,145,930. The total value of hydrocarbons and natural gas was $9,456,025. The increase in output of petroleum for the year was 4,539,698 bbl., and in value $690,011. In structural materials, the total value for the year was $7,943,288, an increase over 1904 of $668,-442. The increase in the output of cement amounted to 296,015 barrels.

The relative values of the principal mineral substances of the State follow in this order: 1, gold; 2, petroleum; 3, copper; 4, cement; 5, borax; 6, macadam; 7, quicksilver; 8, rubble.

While gold is still the leading mining product, its yield no longer puts the greatest gold-producing county in the first place. The petroleum of Kern county and the copper of Shasta give them precedence. Gold is more widely distributed than any other substance thus far mined in California, 34 counties out of the 57 in the State showing a gold yield in 1905, and it is known to exist in several others. Nevada county produces more gold than any other in the State, its output for 1905 having been $3,179,715 in gold alone. Butte county, with its numerous dredgers, comes next. Kern county is now the largest mineral producer in the State, its output of ten substances bringing its total value last year up to $4,912,095. Its petroleum alone was valued at $3,174,966, which was not quite up to Nevada county gold. Shasta county falls into third place for last year, instead of being first as it has been for several years, its copper production having fallen off materially, mainly on account of the cessation of smelting operations at Keswick by the Mountain Copper Company. Shasta's entire output for all minerals was valued at $2,579,014 last year.

The Copper Mines of Portuguese Angola

According to a recent report by F. d'Andrade, the most important copper mines are those of Senza, 192 km. from Loanda. They consist of a layer of calcareous silicious sandstone, impregnated with malachite and azurite. The stratum dips 20 deg. and has a mean thickness of 5 m. and an extension of 200 m. Copper has been traced over an area of more than 60 miles. The presence of calcareous constituents does not allow of treatment by wet methods, as the acid would be wasted dissolving the limestone. On the other hand, there is not enough sulphur to treat by the dry method; but it is probable that developments in depth will show an increase in the amount of sulphur, and then the treatment would be easy. The mine of Senza is well situated at a distance of 2 km. from the railway station of Senza do Itombe, and at 30 km. from the Rio Cuanza.

Other copper mines of Angola are those of Bembe. They contain calcareous clay, with quartz and malachite and iron and manganese oxides. The average copper is 12 per cent., but the works have not gone very deep. They have been worked by the blacks and then by the Western Africa Malachite Copper Company, Ltd., but without success. The greatest difficulty is the question of transport of the ore, as Bembe is not so favorably situated as Senza.

It is generally accepted that the fusing point of an alloy is below that of its constituent metals. However, exceptions to this rule exist. The alloy Al_2Au melts 17 deg. above the melting point of gold. AlSb fuses 400 deg. above either aluminum or antimony, and a mixture of equal parts of sodium and tin melts at from 350 to 450 deg. above the melting points of the respective components of the alloy.

COKE-OVEN CONSTRUCTION*

Methods of Building Coke-ovens—The Beehive Oven, Its Advantages and Disadvantages

BY W. M. JUDD†

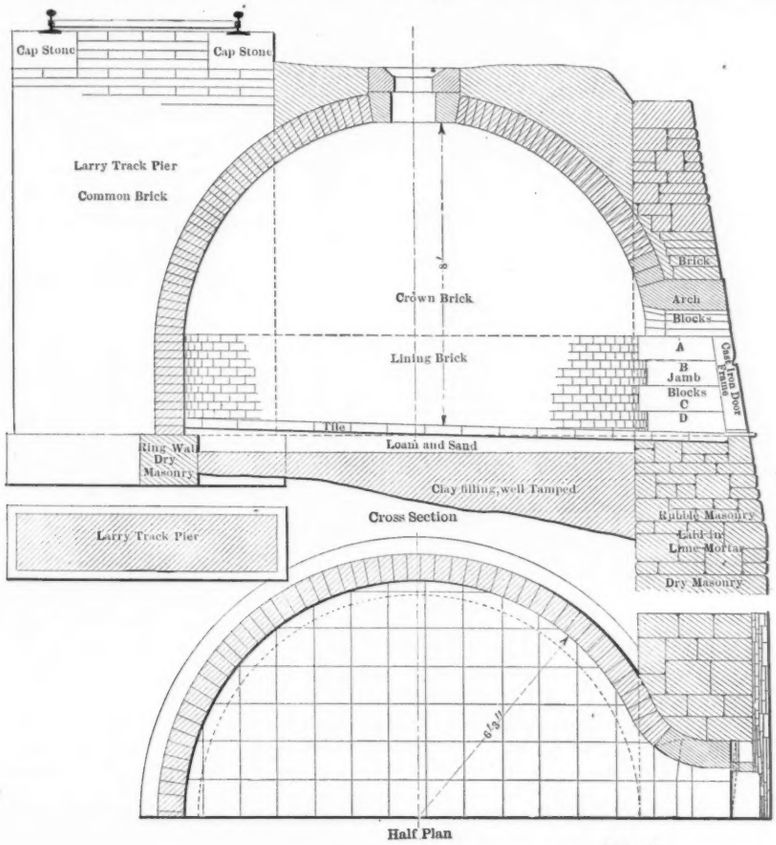
As the necessity for using coke obtained from bituminous coal was forced upon the iron manufacturers by the disappearance of the forests from which their supply of charcoal was obtained, it was natural that the method of its manufacture should have been evolved from the methods previously used in making charcoal. Thus probably the first coke in any quantity was burned from coal piled in heaps on level ground, with suitable flues through the piles built of lumps of coal, refuse coke and slabs of wood for igniting the coal and regulating the supply of air, the whole banked with earth. I have seen a fair quality of coke produced in this way not more than six years ago.

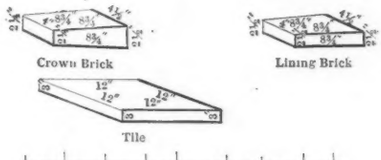
A small, separate kiln, built entirely of brick, was the next step in advance, and from these separate kilns, by the grouping of the kilns in single or double lines, covering the brick work with earth to retain the heat, and building masonry retaining walls for the support of this earth covering, the bee-hive oven, as it is built today, was evolved, and in its essential features has changed very little in construction from its earlier forms.

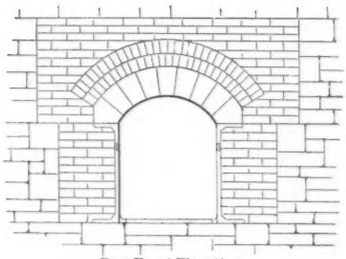
The process for coking coal consists briefly in driving off by heat the gaseous constituents of the coal, leaving the fixed carbon and ash. As this process is carried on in bee-hive ovens, the coal is charged through the trunnel head and spread to a uniform level, the drawing door closed with fire brick plastered with loam, with the exception of an opening near the top for the admission of air, the width of which is decreased as the coking process proceeds. It ordinarily requires 48 hours to complete the coking process, when the brick are removed from the door, the coke quenched with a stream of water played over the coke within the oven, the coke drawn and the process repeated. After the ovens are once heated the coal is ignited by the heat of the oven walls. It is important, therefore, that no more water shall be used than is necessary to quench the coke, and that the oven be re-charged as soon as possible.

As illustrating, however, how long the heat will be retained in a well built oven properly banked, I would cite a case that occurred the past summer, where ovens were charged after being banked for four months, on account of a strike, and almost without exception the coal was ignited by the retained heat of the ovens.

To meet the requirements of this process, the bottom must be smooth, the liners, or fire brick up to the spring line, and the door jambs must be able to withstand the abrasion of the coke-drawing tools; the crown brick and trunnel head must be able to resist the high temperature produced by the combustion of the gases given off in the coking process; the stone and mortar for the face wall must be of a quality that will not disintegrate under the action of heat or the weather; the earth filling must be a material that will not fuse; and the whole construction must provide for the expansion and contraction caused by the sudden changes in temperature when the coke is quenched with water.






Part Front Elevation

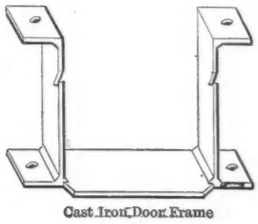

Cast Iron Door Frame

FIG. I

The detail plan of the oven, Fig. 1, shows the construction usually followed. It is advisable to have the oven seat come in solid ground. When this is possible a trench is dug 8 in. to a foot below the oven seat and a ring wall 18 in. wide of dry stone masonry is carried up to oven seat. In the same manner when the face wall of ovens comes in solid ground a dry wall 8 in. to a foot high is built before the mortar masonry is started, these dry walls serving as drains to keep any

*Abstract of paper read before the Engineers' Society of Western Pennsylvania, September, 1906.

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ground water below the level of oven seat. But it is very seldom possible to secure a location such that all ovens can be started with oven seat grade in solid ground. In this case the dry masonry rings are carried from solid ground to oven seat and the dry wall under face wall to within a foot of yard level, then the inside of rings and pockets between rings, which are shown in Fig. 2, are filled with clay tamped in thin layers as the stone work is carried up. Over 20 ft. of dry work below oven seat has at times been necessary.

The liners, the brick for the cylindrical portion of the ovens, 2½ in. thick, 9 in. long, 4 in. wide on the inside and diverging on the sides approximately on radial lines, are usually a fire-clay brick. The crown brick tapering both on the sides and the beds were formerly made of fire clay also, but in recent years either a clay-bond or lime-bond silica brick has been found to give better service, though fire-clay crowns have by no means been entirely discarded. Formerly a thin mortar of loam was used for laying up both liners and crowns, and as a general rule the liners are still laid with loam, but it is the almost universal practice now to lay up the crowns with fire clay. A good quality of loam can very frequently be procured from the creek bottoms near the work, and that it is a cheap and satisfactory material is proven by many old ovens which have been in service for years, but the presence of any considerable quantity of lime or iron will cause it to fuse and run out of the joints, or flux with the brick, causing them to spall. The more uniform quality of fire clay, which must be very finely ground, and the closer joints that can be laid with it have led to its adoption for the crowns. A sweep swung from a grade stake driven to spring line grade at the center of the oven is used in setting the crown brick.

The building of the oven proper is carried on in three stages: "liner high," up to the spring line; "scaffold high," as high as a man can lay the brick standing within the oven, Fig. 3; and "crowned out," the completion of the oven from a scaffold placed inside of it.

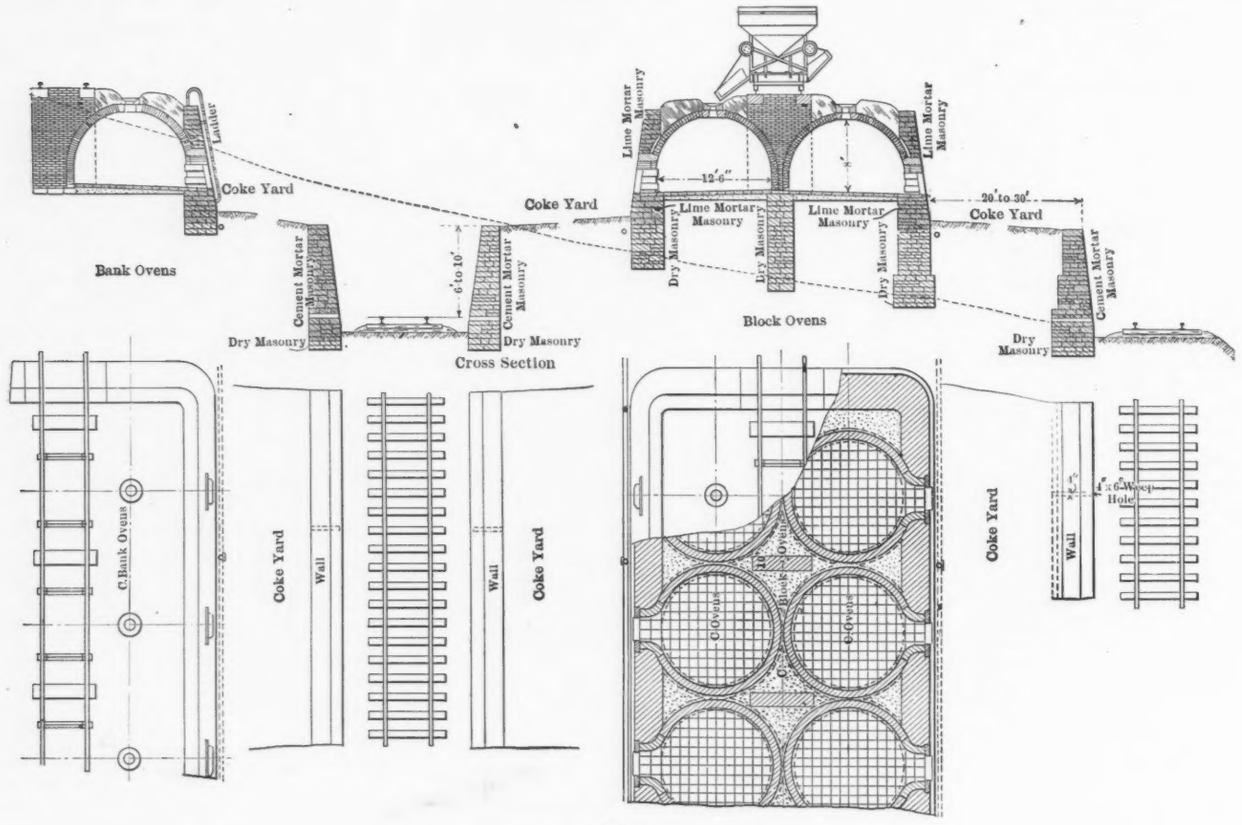

FIG. 2

For the jamb blocks, skews and arch blocks forming the door there are quite a variety of patterns in use, but all following the general lines of the detail drawing.

The tunnel block or ring has usually been made of a single piece of fire clay and has frequently given trouble by breaking in several pieces and falling, or spalling off in small pieces, into the oven. A ring made of several sections of silica of the same quality as the crown brick is now being used—from 8 to 12 pieces to a ring—but has hardly been in service long enough to prove whether it has entirely overcome the troubles encountered with the clay ring.

The upper clay trunnel block, which protects the ring proper from abrasion by the coal in charging, and enables the filling to be carried higher over the crown, is used when the silica ring is adopted, and is a good feature in any case.

Laying the bottom tile is the last step in the construction of the oven proper. The fire-clay tile, 12 in. square by 3 in. thick, are laid on a bed of sand or loam, with a slope of 4 to 5 in. from the back of the oven to the door to facilitate the drawing of the coke and the draining off of the water used for quenching.

The outside of the oven is plastered with a coat of loam mortar as soon as completed, to protect the brick work until the covering is finished. The face walls are built of a sandstone that will not spall when heated. A stone with flat beds and varying in thickness from 4 to 8 in. is sought for the oven wall, and is finished with a rough coping 6 to 8 in. thick. Lime mortar is used for laying up the oven walls. Frequently the lime used is made from the native lime stone burned in piles on the ground near the oven location.

For the filling around the ovens "liner high," the clay is shoveled in from the yard and well tamped, and then the ovens are usually crowned out before any more filling is done. Above the liners the filling is not tamped, but is leveled sufficiently to prevent the crowns from being distorted by unequal earth pressure. Usually a roadway is constructed to the top of the ovens, the trunnel heads are temporarily covered, and the covering over ovens completed with carts in the same manner as a railroad fill is made. The material used for

covering should be tested from time to time, as the presence of fusible ingredients has ruined many ovens within a few months of their completion. Chemical analyses of the clays are sometimes taken before construction work is started; but a fairly satisfactory field test can be made by subjecting a ball of the material to the blast of an ordinary blacksmith's forge.

That portion of the oven wall immediately adjoining the doors is built of common hard burned brick, an arch of two or three rings being thrown over the fire-clay arch blocks. This construction takes the weight of the wall off the arch blocks and aids in repairs as the jambs and arches can be taken out and replaced without disturbing the walls.

The cast-iron door frame is made with the same batter as the face of the oven wall and is anchored to the masonry with wrought-iron rods. The upper brackets carry the outer end of the fire-clay skew-backs. The door frame protects the jamb blocks to a large extent from the wear of the coke-drawing apparatus. In the notches in the sides of the frame is placed a rod which serves as a fulcrum for the coke-drawing tools.

The piers which carry the larry track are built either of rubble masonry or common hard burned brick. The best construction is to build them of rubble masonry laid in lime mortar up to oven seat and of brick above this level. The piers are usually 18 in. wide and 7 ft. long and are topped off with a sand-stone cap-stone under each rail of the larry track. As the piers in a standard 12 ft. 6 in. oven are 14 ft. 6 in. centers the rail acts as a girder between piers, though receiving a little support from the earth covering.

The general practice has been to use a standard railroad section tee rail, 80 to 100 lb., but a more rigid track with less weight of steel is secured by the use of the 7-in. high, 70-lb. street railway section rail. Two cast-iron ties are used between consecutive piers with lugs bolted over the flanges of the rails to hold the track to gage. When the 7-in. high rail is used, tie plates are also bolted between the webs.

Several considerations enter into the construction of the yards and considerable variation can be noticed at different plants.

If a constant car supply from day to day could be counted upon, a width of yard just sufficient for the operation of the coke-drawing tools and the passage of the ash carts would be all that would be required and a yard 12 to 15 ft. wide would be sufficient. But the car supply is far from regular even in the most favorably located plants, and the operator who would avoid banking his ovens and, in turn, stopping the operation of his mines, must provide room for stocking coke; therefore the yards are made 25 to 30 ft. wide where possible.

The hand methods of loading are either forking into coke barrows and wheeling into the cars, or forking from stock piles directly into the cars. Evidently the less grade there is between the yard and cars the easier the work is for the men. If box cars only were to be loaded, a wall 4 ft. high would be sufficient, and some of the older plants were thus constructed. Also, the earlier open-top cars were low gondolas with side racks added and could still be loaded by the use of comparatively easy runways. As the capacity of cars was increased and a larger proportion of open tops built especially for the coke trade came into service, yard walls 6 to 8 ft. high came to be the standard construction with runways cut into the walls occasionally for loading into box cars. In recent years the car supply for many plants has been almost exclusively steel or wooden rack cars, or steel hoppers 10 to 12 ft. high, so that a great many plants built in the last five or six years have adopted a yard wall 10 to 11 ft. high, sometimes building chutes in the walls at intervals for loading box cars. At many of the older plants the yard walls were built of timber crib work, and in some cases walls were dispensed with entirely, timber runways being provided at intervals for wheeling from the yard to cars. Then dry stone yard walls came to be the standard construction, and were indeed a great improvement in appearance and permanence over the crib work and the still more slovenly yard without any walls at all. With the adoption of the 8-ft. and 10-ft. yard wall stability demanded the use of rubble masonry laid in cement mortar. As the railroad tracks are frequently in solid cut the walls act more as revetments than retaining walls and can frequently be built of quite light section. The introduction of the coke-drawing machine, of which I will speak a little more fully later, will undoubtedly bring about a reversion to the lower yard wall.

FIG. 3. OVENS "SCAFFOLD HIGH"

It will be noticed how largely rubble masonry, either dry or laid in mortar, enters into oven construction. Fortunately suitable stone quarries are usually not difficult to locate in the vicinity of the oven location, but sometimes it is necessary to ship in practically all stone required on cars.

The method adopted by contractors in delivering the stone from quarries to the ovens depends upon the number of ovens to be built and the relative location of quarries and ovens. Usually all hauling is done in wagons, but sometimes quarries can be located so that there is economy in laying tramroads and hauling in cars either by horses or dinkey locomotives. Delivery of stone railroad cars is very convenient for building the yard walls, but requires rehauling by teams for the oven walls and piers.

There is no physical reason why concrete masonry could not be used for the yard walls, but in the localities where coke ovens are usually constructed substantial rubble masonry can be built at much less cost.

Water for quenching the coke is supplied by a main usually 4 in. in diameter laid in front of the ovens with a 1-in. connection for attaching a hose for every two ovens. If possible the main in front of ovens should have tank connections at both ends so as to maintain approximately uniform pressure for the whole line of ovens. These tanks should not be over 50 ft. above oven seat, as high pressure in the hands of careless or ignorant coke drawers may seriously injure the ovens.

One of the simplest methods of charging the ovens was by the use of drop-bottom mine cars, running cars from the mine on a track over the center of the trunnel heads and dumping directly into the ovens. This method of course was limited to a small plant, as several cars were required for a single charge and the time required to shift cars was too great to allow of the extension of the system to many ovens. Some form of larry was, therefore, early adopted that would hold sufficient coal to charge a single oven. The drop-bottom larry with the track straddling the trunnel heads was the earlier form, and there are some old plants which are still using this type, but the double side-discharge larry is almost universally used now. In this form the steel coal-holding hopper with sloping bottom is set sufficiently high above the tracks to discharge the coal through the adjustable chutes into the oven trunnels on either side, the track being laid at the back of the ovens on bank ovens and between the two rows of ovens on block ovens. The motive power for the larries has been successively, the mule, the dinkey locomotive and the electric motor. Nearly all the newer plants of any size are using

the self-propelling electric larry, either equipping all larries with motors or using some plain larries as trailers.

At some small plants the coal is dumped directly from the mine cars into the larry; but for a plant of any considerable size there must be a bin for the storage of coal, so that the operation of the ovens may, to a certain extent, be independent of the mine, and *vice versa*. The location of the oven plant is a question that requires careful study by the engineer, and is influenced by several conditions in addition to those already referred to. The railroad connections that can be secured, and the location of the loading sidings so as to give a grade of 1 to 1½ per cent. for shifting cars by gravity along the ovens must be considered in connection with the position and style of the coal bin adopted and the location that can be secured for the larry track from bin to ovens. While an approximate balance of excavation and filling is usually attempted, yet there may be economy in quite large waste of excavation in order to save in the amount of dry masonry required.

For plants not exceeding 100 ovens, bank ovens, that is, ovens built in a single line against the side hill are usually the cheapest to build, as they can be located following approximately the contour of the ground so as to secure the most economical adjustment of excavation and masonry. It is not infrequently the case in narrow valleys with steep side hills, that nothing but bank ovens can be built, except at the expense of excessive excavation and masonry.

The drainage both of surface and underground water must be carefully provided for with bank ovens, and quite expensive work is required at times to divert springs which appear as the excavation is carried down.

As 100 ovens in line require approximately 1500 lineal feet of ground, it is easy to be seen that the extension of a line much beyond that limit will run one into difficulties. Even if suitable ground can be secured for a longer line of ovens, and for the railroad loading track, the additional travel of the larry will cause delay in charging, or the use of more larries. Block ovens, that is, ovens built back to back in a double line, occupying less ground, and served by a single larry track located on the center line between the two lines of ovens, are therefore better adapted to the larger plants. A very economical arrangement, where the ground is suitable, is the combination of one line of bank and one line of block ovens, one loading track in this case serving for the bank ovens and one inside of the block.

With the mine opening and the railroad tracks fixed, the engineer may have very little latitude as to the location of the oven plant, but economy in construction and operation of both mines and ovens can be secured by a careful study of both surface and underground topography before locating mine openings, branch railroads and coke ovens.

A few points will now be touched upon in the operation of coke ovens, which have had an influence on their construction in the past, and may cause more radical changes in the future.

Anyone who has watched the method of drawing coke by hand must have wondered that some mechanical process had not been adopted to do away with such heavy and disagreeable work, and many experiments have been made and machines more or less successful have been built. At least one style of machine has come into quite extensive use in the past year or so, probably to a large extent because ovens already built can be adapted to its use with slight changes. This machine, operated by electric motors, runs on a track in front of the oven doors. A wedge-shaped shovel, operated by a rack and pinion sliding on the oven bottom, lifts the coke on the forward stroke and scrapes it on the back stroke onto a conveyor running parallel with the ovens, and a cross-conveyor delivers the coke into railroad cars. This latter conveyor is adjustable so that any hight of car can be loaded. It will be seen, therefore, that at a plant using this type of machine exclusively, if no provision were made for stocking coke, a yard only wide enough for the operation of the machine and practically on the level of the railroad tracks could be used. The safer plan, however, would be to provide some storage for coke and at least a low yard wall to render the reloading of stock coke less difficult. The only changes in the standard construction to accommodate this machine have been to provide wider doors to the ovens and increase the hight from yard level to oven seat about a foot. The wear and tear on the ovens by the machine is quite noticeable, especially the abrasion of the jambs and tile.

The increasing difficulty of securing coke drawers and the decreased cost of mechanical drawing will undoubtedly lead to the wider adoption of coke-drawing machines, of the type described above, or of some other type, and it would indeed be strange if further modifications of the bee-hive oven were not made to better adapt it for the use of machines.

Even the casual visitor to a coke plant is impressed by the apparent waste in the smoke and flame issuing from every trunnel head, and to the engineer this constant loss of energy seems little short of criminal. In the by-product oven the attempt has been made to utilize as large a percentage as possible of the gases and heat given off in the coking process. No discussion can be entered into at this time as to the relative merits of the coke produced by the by-product ovens and the bee-hive type, or of the practical reasons that have prevented the erection of the by-product ovens at the mines to any large extent. A successful utilization of a portion of the waste heat, however, is now being accomplished at some of the more recently completed plants. This consists in using the waste heat for generating steam in the power plant. The construction adopted up to date has been to connect each oven of a line of bank ovens by a flue, with a main escape located at the rear of the ovens, conducting the gases to the boilers. A very effective demonstration of the power wasted by the bee-hive oven is given at a plant recently completed where from the waste heat of 50 ovens all the electric power required both for mining operations and at the coke ovens, for two plants aggregating 800 ovens is being generated at the present time; and at this same plant, within a short time, 100 ovens will furnish the power for the operation of five mines and coke plants, aggregating 1500 ovens. If a market for the power could be secured a further development of the use of waste heat for power purposes would doubtless bring about the making of other changes in the construction of the ovens.

Whether run-of-mine coal can be charged directly in the ovens, or whether the coal must first be crushed, or whether it must be washed, as well as crushed, may have a very material influence upon the location of the ovens and some of the details of their construction.

Fuel in Kansas City

Kansas City, and adjacent manufacturing districts, are now supplied with three kinds of fuel, coal, crude petroleum and natural gas; the oil and gas being conveyed by pipe lines from southern Kansas and Oklahoma. Natural gas is supplied to concerns using one million cubic feet daily at the rate of 8c. per 1000 cu.ft., and oil is supposed to be delivered on large contracts at about 45c. per bbl. At these rates coal is being crowded out of the market, especially causing the demand for slack to fall off, wherefore the producers of coal have to make good their margin of profit out of the domestic and non-competitive trade. Several of the large packing companies, which rank among the large consumers of fuel, have changed from coal to oil or gas. As an incident in this industrial revolution it is remarked that there has arisen a great scarcity of cinder for use in the preparation of concrete, and the sidewalk contractors and others are being obliged to substitute gravel, which is somewhat more costly than cinder has been heretofore.

In quenching the coke in an oven preparatory to drawing, much care should be taken to see that the stream of water from the hose strikes the coke and is not carelessly allowed to play against the superheated brick. This latter action accounts for so much spalling off of the brick.

Smelting at Kansas City

EDITORIAL CORRESPONDENCE

Kansas City, or rather Argentine, was once an important smelting center, when the Consolidated Kansas City Smelting and Refining Company smelted a large quantity of silver-lead ore received from Sierra Mojada, Mexico, and refined an immense tonnage of work-lead and matte from Colorado, Mexico and elsewhere. The plant, which was especially the creation of the late August R. Meyer, was rated among the most efficient. However, after the American Smelting and Refining Company had centralized the industry, there was no need for refineries at both Kansas City and Omaha, which commanded substantially the same markets, and the order was given to dismantle Kansas City. In some respects this was a pity, because only a little while previous a large amount of money had been expended in the improvement of that plant, and there were in use some of the most interesting hydrometallurgical processes, especially for the production of copper sulphate from matte and the manufacture of zinc sulphate as a by-product in the refining of work-lead, that were practised in the United States.

At present the famous old plant is a scene of desolation. All that remain standing are the office building, a portion of the concrete flue, the main chimney, which towers alone, and the chemical buildings at the west end of the tract. The latter buildings were erected on the following plan: Timber frame, and sides closed in with expanded metal and cement plaster. This proved a highly serviceable type of building for the purpose intended, it being necessary to avoid the use of iron work, and the structures, being still in an excellent state of preservation, they were left standing, apparently with the idea that they might some day be utilized for manufacturing purposes. Otherwise a clean sweep was made of the old plant. A little of the machinery was shipped to Omaha, but the major part was sold as scrap, while such brick and timber as had any value went also the way of old material.

The only plant which now gives Kansas City any consideration as a metallurgical center is the Argentine works of the United Zinc and Chemical Company, which, after various vicissitudes of fire and flood, appears to be running successfully. This plant was originally erected by the Southwestern Chemical Company to coöperate with the Consolidated Kansas City Smelting and Refining Company, making sulphuric acid from Western pyrites and turning the cinder over to the smelter. When the smelting works went into the trust, Mr. Meyer retained the chemical works and subsequently consolidated them with the Standard Acid Company, which was making spelter and sulphuric acid at Iola, Kansas.

The Argentine plant is now making sulphuric acid, which is marketed both as tower acid (60 deg. B.) and concentrated (66 deg. B.), muriatic acid and nitric acid. The output of sulphuric is equivalent to about 100 tons of 60 deg. B. per 24 hours. The source of sulphur is exclusively zinc concentrate from Leadville, Colo., which is produced by the American Zinc Extraction Company, an affiliated concern.

The American Zinc Extraction Company operates the Yak mill, which treats about 200 tons of ore per day, chiefly from the Moyer mine of the Iron-Silver Mining Company. The Yak mill is equipped with International magnetic separators (described in the JOURNAL, vol. 80). These separators are of the high-intensity type, capable of treating raw ore, and at the Yak mill have been found to give excellent results.

The concentrates received at Argentine are roasted in Hegeler and Hofmann-McDougall furnaces, both of which have been found efficient for the purpose, and the burned ore is shipped to Iola, Kan., for reduction to spelter.

Kansas City has proved to be a good distributing point for sulphuric acid, although when the manufacture was begun there, and at Iola, doubt was expressed as to the profitable distribution of the product. However, it seems to be the fact that when the manufacture of sulphuric acid is begun at any reasonable place a market for it will rapidly develop, which is to be explained by the essential character of the commodity and the multitude of uses for which it is required.

Oil and Gas in Southern Kansas

EDITORIAL CORRESPONDENCE

To one who was present at the beginning of the boom in oil and gas in southern Kansas, and witnessed the early development of the industry in that region, it is evident in a visit of a little more than three years later that the excitement has passed away. The front wave of wildcatters, promoters, and speculators has moved southward into what is now the State of Oklahoma. The territory from Cherryvale and Neodesha southward to the line has been well tested, and while some of the farmers still live in hopes that their land lying between the proved pools will turn out some day to be productive, considering perhaps that a single dry hole on a quarter-section was insufficient to demonstrate conclusively that neither oil nor gas existed within its boundaries, the time is different from that when every agriculturist dreamed of an income from oil, and no more planting corn.

There have been substantial results from the boom. There has been a good oil pool at Bolton, southwest of Independence, and at Wayside, a little farther on. At the Canary and Jackson pools, southeast of Caney, just over the State line, there are forests of derricks. Farther south, at Bartlesville and Tulsa, there is a great center of activity. Gas wells are found all over this territory, interspersed among the oil pools, but especially near Caney and in the territory immediately to the southeast do there appear to be important gas areas, which develop the biggest gas wells of the State. There is no difficulty in marketing gas now, because there are pipe lines to Kansas City and to Joplin, the investments in which are so large that all the available gas is wanted for them. Nevertheless, it is still possible for shrewd buyers to secure supplies of cheap gas for zinc smelting, brick making and such purposes.

The results of the oil and gas boom are manifest in the thrifty appearance of many of the farms and the bustling activity of many of the towns, like Independence and Coffeyville. Independence continues to be a center, where the important supply houses carry large stocks of pipe and fittings. The Santa Fe railway has built a branch line from Havana southward to Bartlesville, passing, through Caney so it is easy to travel through the district. Train service has been generally improved, one of the new things which is comfortable being the running of a sleeping car between Kansas City and Independence. One thing which does not seem to improve is the hotels, which with few exceptions continue as dirty and uncomfortable as of yore.

Manganese Mining in Virginia

The Manganese Corporation of Virginia will shortly commence shipments from its manganese mine at Vesuvius, on the Shenandoah branch of the Norfolk & Western Railway, probably at the rate of 25 to 30 tons per day. These mines have in the past shipped some small tonnages of ore, but only recently have steps been taken to place the plant and the working in shape for extensive operation. A new double-compartment hoisting shaft has been put down, and the top works have been rearranged, while a body of good ore of considerable extent has been blocked out ready for stoping. The ore is of excellent quality, showing from 45 to 47.72 per cent. manganese, and as low as 0.065 per cent. phosphorus. The opening of the mines has been in charge of Edgar C. Moxham, mining engineer, of New York, who will continue to direct their operation.

When a thick, heavy oil is necessary to run a machine, it is proof that the bearings are rough or not properly adjusted, and in such cases graphite is almost indispensable, as it is far more economical to smooth up the bearing with graphite than to use the necessarily large quantity of heavy oil to keep them running cool.

Colliery Notes

Practical experience has proved that beehive ovens act best when built 12 ft. 6 in. wide. When ovens are larger than this the arch is too wide and cannot well resist the pressure.

In beehive ovens, silica brick are better for crowns than fireclay brick. For liners, however, the silica brick are softer and do not stand the abrasion of the drawing tools as well as fireclay brick.

Heating boiler feed-water not only increases safety and economy, but results in a precipitation of the carbonates of lime and magnesia, preventing these substances from being introduced into the boiler.

With regard to the cutting tools used in the percussion type of coal-mining machines, the simpler forms of a single × bit with ⅜ chisel cutters without a central point have proved most satisfactory in English mines.

In 1903 there were 1956 by-product ovens in the United States, producing 1,882,394 short tons of coke. In 1904, 2910 ovens produced 2,608,229 tons. In 1905 there were 3159 by-product ovens producing 3,462,348 tons of coke.

Present practice in coke manufacture has not found the use of concrete for face walls satisfactory. Experiments along this line showed good results for two years, but at the beginning of the third year the concrete had crumbled to dust and could be scooped out of the solid wall.

At coke plants where the product is quenched by spraying with a hose, it is not advisable to have the tank for furnishing the water at an elevation of more than 40 ft. If the water supply is placed higher than this, the force of the stream will injure both the coke and the oven.

It is not advisable to build coke yards less than 30 ft. in width, because of the frequent necessity to store coke due to an irregular car supply. If the yards are too small, it becomes necessary either to bank the ovens or to shut down the mine. Such action is always undesirable as well as expensive.

As a general rule bank ovens, or ovens built against the side of a hill are cheapest to construct. It is necessary in erecting such ovens, to provide for the drainage of all surface and underground water. Block ovens, that is, ovens built back to back in a double line, occupy less ground, retain the heat better, and can be served by a single larry track.

There are at present in the United States 525 coke-manufacturing plants, with nearly 90,000 ovens in all. In 1905 there were 80,742 ovens in operation, which produced 32,231,129 short tons of coke. The output for each coke plant in 1905 was 33 per cent. greater than in 1904, while the coke output in 1880 was only ¼ of what it was in 1905.

Attempts are being made to develop the coal deposits in northern Butte county, South Dakota. The most extensive work is being carried on in the Cave hills. A tunnel is being run into the hills, following a 6-ft. seam of lignite, which has already been extended 70 ft., the intention being to drive the tunnel under the sand rock which comprises the rim rock of the hill.

Under no circumstances should a miner open a keg of powder or other explosive until his lamp is placed at least 10 ft. distant from the powder. The laws of several States specify 5 ft. as the prescribed safe distance, but where a large volume of air is circulating it is possible that the air current will convey sparks to the explosive and endanger the lives of all those in the mine.

Recent tests have shown that the risk of sparking is by no means entirely precluded by the substitution of polyphase for continuous-current motors, even when the latter are cased in. Rotary motors, however, are free from the defect, inherent in piston motors, of setting up shock and vibration in a direction parallel to the work; and they also have the advantage of working more easily and with less noise.

A coke oven should have at least 3 ft. of clay or good selected loam under the hearth. If the oven is to give good results it must be able to hold the heat, which cannot be done if the oven is not properly drained. If water seeps into and under the floor there is sure to be trouble, for the oven cannot be kept hot under such conditions. Ovens that are idle and allowed to freeze and thaw, will quickly deteriorate upon again being fired.

At the Sopris mine of the Colorado Fuel Company on Oct. 14, the superintendent stopped the fan, the first time in 180 days. The fire-boss found everything all right that morning, but after the fan had been stopped eight hours for repairs and started again, the men upon entering the mine found doors and brattices blown down, cars derailed, and other evidences of an explosion. No fire was found in the mine nor is there any clue as to what caused the explosion.

The largest independent coke company in the Connellsville region has adopted a new machine for handling coke at the ovens. The invention was installed and successfully tested at the Mt. Braddock works, where it is claimed that by using the machine, four men can charge, water, draw and convey coke from 100 ovens, thereby doing the same amount of work which now requires from 40 to 50 men. The oven is also a radical departure. It is rectangular, four feet wide and 30 ft. long, the crown being cone-shaped.

With machines used in coal mining it has been found that when double shifts are used to operate the same machine, considerable trouble caused by breakdowns often ensues. Machines are somewhat like people, and if they have pounded through an 8-hour shift, using a long, slow, hard stroke, the machines dislike to change to short, quick strokes when a different operator takes hold. Big men generally make the best runners, and it is advisable to always have loaders and machine men of the same nationality working together.

The size of pulleys in relation to the diameter of transmission ropes is an important consideration with a view to securing the best results with the least possible waste of the initial energy at command; and it is found from experience inadvisable to run a cotton rope over pulleys less than 30 times its own diameter without making extra allowance for loss of grip. By reason of the great disparity in elasticity at least 50 per cent. should be added to this limitation when manila ropes are used.

When boilers are fired by hand, the greatest loss incurred is due to the opening and shutting of the furnace doors. This operation permits a large quantity of cold air to enter the furnace, and reduces the temperature from 200 to 700 deg. This allows a large percentage of the combustible matter to go up the stack unburned. One investigator states that in careful observations with a stop watch, the furnace doors were open for 2 min. and 29 sec. every 7.7 min., making 7 hours and 12 min. in every 24 that the doors were wide open.

Several important tests recently made prove that the refuse from coal washeries can be burned to advantage. The fuel and water were weighed, and hourly readings of all other essential conditions were recorded. The coal that had formerly been used for firing cost $1.24 per ton. The slate and waste slack cost 50c. per ton, delivered at the boiler house. Allowing for an extra man on each shift to handle the increase in refuse, and considering that 63 tons were consumed daily, the final results showed a saving of more than $43 per day, if the slate and waste slack were used instead of coal.

In settling the dust along roadways in a coal mine the use of both salt and the chloride of calcium has met with success. Three or four days after salt has been applied the road becomes quite damp and the dust which is on it becomes caked. One ton of calcium chloride, costing $12 per ton, will treat an ordinary entry for a distance of 1500 ft. Salt, however, costing but $3.50 per ton, will cover almost as great an area as calcium chloride, and is therefore considerably cheaper. One step toward eliminating dust from our mine haulways would be to use better cars, instead of the many at present in use with large cracks, permitting fine coal to drop out all the way to the shaft or drift mouth.

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The Carmichael-Bradford Process

We mentioned some time ago that a German patent on the Carmichael-Bradford process for the desulphurization of galena, the issuance of which was opposed by the owners of the Huntington-Heberlein patent, had been allowed. We have now received a translation of the full text of the decision, reference to which is well worth while. In the first place, it throws some light on the legal status of all the lime-roasting patents, or rather the view that the courts are likely to take. The investigations of the Imperial German Patent Office, which rationally precede the issuance of the patent, are extremely rigid, both technically and legally, and its decision naturally carries great weight. The matter is of considerable importance in this country, inasmuch as an installation of the Carmichael-Bradford process is shortly to be made at the works of the United States Smelting Company, near Salt Lake City, Utah, and other installations are contemplated. As our readers are well aware, the Huntington-Heberlein process is in use at many of the works of the American Smelting and Refining Company.

In the second place, the decision of the German Patent Office throws some light on the reactions which are involved in the lime-roasting processes. As is well known, there have been two views as to what takes place in the desulphurization of galena in this way. According to one view, the oxidizing action is entirely atmospheric; while according to the other view there is reaction among the elements of the charge. The various views were well expounded in an excellent series of articles by German metallurgists, published originally in *Metallurgie*, and subsequently in the JOURNAL. Incidentally, it may be remarked that some of these articles were probably inspired by the recent litigation, in which many well known metallurgists were retained as experts.

According to the German patent practice, the statements of an inventor must be proved, if proof be considered necessary. Under this requirement, an elaborate series of experiments was carried out by Mr. Carmichael at Stolberg, Rheinland, under the inspection of the representatives of the Patent Office. These experiments proved that the process was practicable, which of course everyone knew, inasmuch as it had previously been in regular use in Australia, and also proved what had been experienced in Australia, namely that in blowing air through a mixture of galena and gypsum under the proper conditions, there is not only a desulphurization of the galena, but also to some extent of the gypsum. We have previously called attention to that fact as indicative that there is indeed a reaction betwen the two minerals, although Professor Doeltz attempted to show that there was not. As a secondary phenomenon, the German Patent Office called attention to the fact that the gas from the Carmichael-Bradford process is much richer in sulphur dioxide than that from the Huntington-Heberlein process.

From the legal standpoint the gist of the recent decision is that the preliminary roasting is a fundamental part of the Huntington-Heberlein process, and that when Carmichael and Bradford dispensed thereof by adding gypsum to the galena and then accomplished desulphurization by direct blowing, they made a distinct and patentable invention.

However, we remain still in the dark as to the precise nature of the reactions which take place in these processes. It has been well shown that when air is blown through a mixture of galena and gypsum under the right conditions there is a desulphurization of both, to more or less extent, this implying a reaction of some kind, because we cannot conceive that gypsum alone could be desulphurized in that way. On the other hand, Huntington and Heberlein remarked in their very confused original patent that instead of lime, ferric oxide might be used in the charge. We understand that this is indeed now being carried out at certain plants in the West. Charges of lead-bearing sulphide ore, free from lime, are being successfully desulphurized in pots. When that be done, the term "lime roasting" obviously becomes meaningless, because there is no lime present, and as a substitute Professor L. S. Austin has proposed the term "pot roasting," which is expressive and precise. Of course, this would imply nothing but atmospheric oxidation, the ferric oxide, or other non-calcareous material simply acting as a diluent of the sulphide. However, the advocates of the theory that lime or gypsum play some chemical part in the process have never denied that the oxidizing effect of the air blown through the charge is not a pow-

erful, perhaps the most powerful, factor. It is not impossible that "pot roasting" and "lime roasting" may come to be regarded as distinct processes, the former as a simple modification of ordinary roasting, and the latter as a further modification, in which lime or gypsum plays some chemical part.

Depreciation of Smelting Plants

Recently in giving testimony in a case on trial at Butte, Mont., Mr. Mathewson, of the Anaconda company, was reported as remarking that 5 per cent. of the original cost of the plant is a sufficient allowance for depreciation, or amortization. This led us to request of Mr. Mathewson a further expression of his views on the subject. His letter in reply is printed on a subsequent page of this issue. It is to be hoped that this introduction will lead to full discussion of an important subject, which heretofore has scarcely been touched upon in the literature of metallurgy, notwithstanding the fact that its significance as a factor in the cost of production ought not to be overlooked. However, in many estimates and statements no account at all is made of it.

The disregard of this factor is one of the causes of misunderstanding between miners and smelters. The miner is impressed by what appears to be too large a difference between the smelter's "margin" and his operating cost, and is convinced thereby that the smelter is enjoying too big a "rake off," losing sight of the fact that the smelter has to do something more than earn a mere interest on his investment. The disregard for the same factor is a reason why many investors in metallurgical undertakings—custom plants, works for the treatment of the ore of a particular mine, etc.—find ultimately that they have lost money, when they thought they were making it. Stated briefly, the principle is simply that when money is invested in a plant, it must be reimbursed in some time or other, and some kind of an allowance must be made annually for this purpose before dividends can properly be considered. The answer to the question, "What time?" is the one which calls for most judgment by the engineer and capitalist.

It has been most commonly assumed in estimates, wherein this factor has been taken into consideration, that an amortization of 10 per cent. should be reckoned; in other words, the original cost of the plant should be returned in 10 years. Mr. Mathewson considers that this is too high in the case of copper-smelting plants. Certainly his opinion carries great weight, as his experience in the charge of the largest smelting plant in America has given him peculiar advantages in the study of many matters bearing upon this problem. However, we are disposed to question the safety of a generalization of 5 per cent. amortization for copper-smelting plants for two reasons: (1) In many cases the commercial life of a plant cannot be relied upon for so long a period as 20 years. (2) Although the plant be maintained at the highest degree of efficiency as originally designed, or even be improved more or less, the writing off of only 5 per cent. for amortization may not allow adequately for the discarding of portions that become antiquated—in other words, a 5 per cent. allowance may not be sufficient to cover what Andrew Carnegie has referred to as depreciation due to advance in the state of the art.

However, it is not our intention to discuss this question any more fully at the present time. We hope that our readers will contribute views based on their own experience, and will not limit their discussion to copper-smelting plants alone, but will extend it to all metallurgical constructions. The range for the expression of judgment is wide. It extends from an amortization period of 20 years to one of only two years, or possibly less; we have known special cases where it was imprudent to look for the return of the investment further ahead than two years. On the other hand, a plant upon dismantling may realize only a small part of its original cost, as shown by the highly interesting, and we believe unique figures which Mr. Mathewson communicates; or it may return a comparatively high proportion, as in the case of a sulphuric acid plant, wherein a large percentage of the first cost is sheet lead. There are many different conditions to consider, and the importance of the subject is amply sufficient to merit a careful discussion.

Ore Buying at Joplin

A recent innovation in the Joplin district has been the purchase of ore on the basis of actual dry weight, there having been heretofore an arbitrary deduction for moisture, or the ore has been bought at so much per ton of gross weight. Of course the smelter did not aim to pay zinc prices for water, and practically did not, however it might appear. The recent change in method, effected by concerted action of the smelters, simply puts the business on the same rational basis that prevails elsewhere. Nevertheless, indignation has been expressed by some of the miners at what is conceived to be a new scheme of the smelters to get ahead of them. How ill-founded are these complaints is shown by Mr. Zook, the statistician of the district, in his weekly report in the Joplin *Daily Globe* of Oct. 28. He said:

"Zinc prices now average a little better than before the settlements were changed to a dry-weight plan. Those who did not previously soak their ore are getting the best of the new deal, but those who used water freely are not reaping so large a gain. Deductions in Joplin, for the ordinary run of ore, range from 2.25 per cent. to 2.80 per cent., rarely more. In Galena deductions run from 3 per cent. to 5 per cent., largely on account of the ore being ground finer in milling. There is no kick by any producer in the district who has not been trying to sell water to the smeltermen, and the change insures a better price, as smeltermen can figure with some degree of certainty upon the amount of spelter that can be produced from the weights they pay for."

Of course it can not be effectively gainsaid that the only rational method of buying ore is on the basis of its dry weight. However, the moisture in the crude ore must be fairly determined. In sampling concentrates, of which substantially the entire product of the Joplin district consists, this is not a difficult thing to do. The chance for error that is present when part of the ore is coarse and part fine does not in this case exist; the concentrates are fairly uniform. Of course, the sample should be taken at the time the weight is made, it should be forwarded in an air-tight can to the assayer, and in assaying the moisture should be eliminated at a temperature of 100 to 102 deg. C., carefully regulated. We have no doubt that the miners and smelters in the Joplin district will soon agree upon a procedure which will be mutually satisfactory.

EASTERN CANADA is now the scene of a mining excitement which far exceeds the British Columbia boom of several years ago. Cobalt is the center, but it is fast spreading outside of that district.

Corner Plates for Mine Cars

The success of mining, generally, depends on carefulness in small matters, little economies counting in the long run. Coal cars are most important, and while the frames, running parts, bearings, hooks, etc., have been brought to a high state of perfection, the sides and corners have been somewhat neglected. Mine-car corners are notoriously weak, a blow or shock generally ripping the sides longitudinally, in the case of wood cars.

To strengthen the corners of cars, Mr. Hanley, an English mine manager, has patented the corner plates shown in Figs. 1 and 2, and applied these plates to coal cars as shown in Fig. 3. Fig. 1 is re-

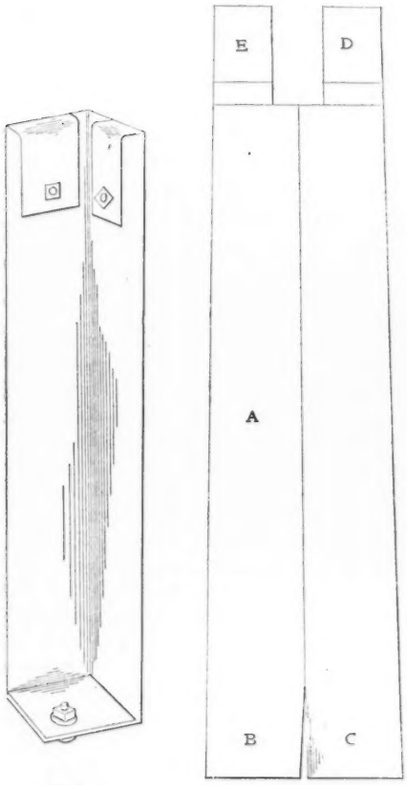

FIG. 2 FIG. 1

Improved Corner Plate for Mine Cars.

cessed at the top and slit at the bottom, the distance between being the length of the car. It is then bent along the vertical dotted line to fit the corner, *E D* being bent at the dotted lines over the top, and *B C* bent over at bottom. Fig. 2 shows the plate after being bent, *B C* being bent after the plate is fitted to the sides, and shows the positions of the bolts. Fig. 3 shows the plate fitted to the car, and is from a photograph taken a few minutes after the coal was dumped from the car. The plate completely covers the corner and binds all parts of it together. When the car is subjected to shock, the plate converts all stresses into tensile, which it resists by its tensile strength, and prevents the sides from being ripped horizontally along the grain of the wood, throwing the stress on the bending resistance of the side planking. As the sides of wooden cars are easily ripped horizontally, their bending is much greater than their ripping resistance; therefore, the sides are much stronger with this plate fitted.

The corner plate for wooden cars is made of sheet iron or steel from 20 to 13 Brown & Sharpe gage, and for iron cars from plate iron and thin angle iron, the latter being preferable.

Three years ago, 100 cars were fitted with corner plates as an experiment, and since that time about 700 cars at the Easton and Dean Lane collieries have been fitted. Fig. 3 is a front view of one of these, and after being at work for three years it looks as good as new, although the tub itself has often been repaired. A close inspection shows that the plate is well worn, the rust caking, and pittings can be seen, while it is nearly worn through. Many of the plates, when taken off, are seen to be almost like a piece of gauze.

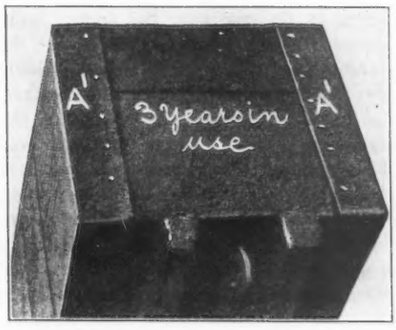

FIG. 3

As these tubs run from four to eight miles per hour on inclines up to a mile long, and from 25 deg. to 70 deg., they are naturally subjected to heavy usage, especially going round from a steep incline into the flat partings and wall-mouths in trains of 10 to 15, their ends bumping against one another. This bumping does not damage the plate, except by knocking off the rust and leaving a new surface to become wet and rusted. The tub shown in Fig. 3 is 4 ft. by 2 ft. 3 in. by 2 ft. 1 in., holds 8 cwt. of coal and 12 cwt. of dirt. The frames are oak; they have cast-steel wheels and open bearings; the hook has 20 tons breaking strain.

The weight of a set of these corners is about 6 oz. less than the old hoop-iron corners, and they require 34 fewer nails or other fastenings. The cost of bending, punching, and fitting is about the same as for hoop-iron, those shown costing 18c. per set of four. They are, therefore, lighter and much stronger and more durable, while fewer fastenings are required.

The Smelter-Smoke Question in Utah

Judge John A. Marshall, of the Federal court at Salt Lake City, Nov. 5, handed down a decision granting an injunction against the American Smelting and Refining Company, the United States Smelting, Refining and Mining Company, the Utah Consolidated Company and the Bingham Consolidated Company.

The decision is in the so-called smelter-smoke cases brought by 409 farmers living near the smelters in the Salt Lake valley, who allege that their crops have been injured by sulphur and arsenic fumes.

The court enjoins the companies from smelting any ores containing more than 10 per cent. of sulphur.

Thirty days are given for appeal, and the cases will be carried up at once. The decision will not force the smelters to close down, although most of them are working on ores carrying more than the amount of sulphur fixed by the court. They will continue in operation while the appeal is pending. If in the meanwhile means are introduced for neutralizing the noxious fumes, the injunction becomes inoperative.

In Australia there is apparently a continuous belt of granite extending from northeast Victoria to northeast Tasmania. It has been proved to contain tin in various parts of Victoria, and in Tasmania fair returns have been obtained from it. The Tasmanian portion of the belt is more frequently met on the surface, and therefore has been more subject to weathering than the Victorian portion. This has resulted in the rich tin washes which enable the Tasmanian tin companies to obtain satisfactory returns.

The great oilfields of Texas and California do not produce natural gas in proportion to their oil production. California, which produced in 1905 a greater quantity of petroleum than any other State, stands ninth in the list in production of natural gas. This is probably caused by the fact that the oil-producing formations of California have been much tilted, and are often faulted, which condition has caused the formation of vents and cracks, through which large quantities of natural gas have escaped.

The known main productive areas of natural gas in the United States are in connection with the great oilfields. In the Appalachian field this area extends along the western slope of the Appalachian mountains from New York State into Kentucky and Tennessee, with strong probabilities that the future will see it extended into the northern part of Alabama, and possibly into Mississippi. The gas is produced from the same porous sandstone and limestone rocks in which oil is found.

Masonry Foundations for Mortars of Stamp Mills

BY ARTHUR B. FOOTE*

The article by Courtenay DeKalb on stamp-milling practice which recently appeared in the ENGINEERING AND MINING JOURNAL is so up to date and authoritative that his condemnation of the use of masonry for mortar foundations will undoubtedly carry great weight, and may discourage its use in future construction. This is unfortunate, as the old-style wooden built-up blocks have been the weakest point in the construction of stamp mills, requiring to be renewed, as Mr. DeKalb states, in from 8 to 10 years, at considerable expense, and causing a serious loss of profit while the renewal is taking place. Moreover, the common practice of resting the battery posts on sills bridging the mortar pits is unsatisfactory, as the sills always spring slightly under the impact of the stamps on the cams, causing the whole battery frame to vibrate. These sills, and the mud-sills under them, often rot out in much less time than the mortar blocks, calling for more expensive renewals.

There are still only a few mills built with masonry mortar blocks. As is usually the case with innovations, because some of these few, through faulty construction, have proved to be failures, the idea is spread abroad that masonry is unsuitable for mortar foundations. The fact that some have been built that have stood the test should be taken as proof that it is possible to build them. If the proper lessons are learned from the successes and failures, this ideal construction may be adopted in the future. In spite of the fact that millwrights have had long experience in the construction of built-up wooden blocks, instances are not uncommon in which such blocks have failed in so short a time that if these had been the first of their kind ever built, they would undoubtedly have been cited as proof that such construction was impracticable. The worst case of the kind which the writer has had the opportunity to observe is that of a 40-stamp mill built in 1900. The construction was in charge of a millwright who had had wide experience. The mortar blocks were built up of 2x12-in. Georgia pine, and the mortar pit was in solid rock. Almost as soon as the mill started running, the anchor bolts began to show signs of splitting out through the tops of the blocks, and attempts were made to hold the blocks together with clamps and bolts. After the mill had been running a year all the mortars had to be moved off their foundations, the tops of the blocks dressed off level, and longer anchor bolts put in to reach down to the undamaged portions of the blocks. It seemed questionable then if they could be made to last more than two or three years. Such a delay as this occasioned is very expensive to most mining companies.

The writer has had the opportunity of observing three mills with masonry foundations, and will attempt to describe these and their behavior with continued service.

The first case is that of a 40-stamp mill built in 1886. The mortars were provided with front, back and end liners, and are still in use. The battery posts rested on the bottom of the mortar pit, a much better arrangement than that of resting on sills bridging the pit, referred to above. In 1899 the mortar blocks and bottoms of the battery posts were so badly rotted that they had to be replaced. Masonry foundations were built up from the old foundations, and granite capstones 6 in. wider than the bottoms of the mortars and 18 in. thick were placed on top of the masonry, the capstones being long enough to make a close joint under the centers of the battery posts. The battery posts were cut off and bolted to cast-iron pedestals, which in turn were anchored to the masonry, the anchor bolts passing through holes drilled in the granite capstones. The old anchor bolts were used for holding down the mortars, also passing through holes drilled in the capstones. A thin sheet of lead was placed between the bottom of the mortars and pedestals and the capstones. When the mill was started some of the mortars "teetered" on the foundations; attempts to prevent this by tightening the anchor bolts resulted in the breaking of the bolts. The mortars which gave trouble were taken off, and found to be slightly convex on the bottom. The tops of the capstones were dressed slightly concave, and a sheet of rubber ¼ in. thick substituted for the sheet lead under all the mortars and pedestals; no further trouble has developed. The anchor bolts do not work loose, neither does the rubber seem to wear. The mill is now equipped with 1000-lb. stamps dropping 8 in., 96 times a minute.

The second case is that of a 10-stamp mill moved to a new location in 1902. The mortar foundations were of concrete, of the proportions 1 cement, 5 sand, 9 broken stone. It was intended to make the top portion of higher grade concrete, but by mistake it was not done. Nothing was placed between the mortars and the concrete to act as a cushion. The top of this foundation went to pieces soon after the mill was started. After removing the poor concrete to a depth of 2 ft. and building up again with proportions of 1 cement, 2 sand and 3 broken stone, no further trouble was experienced.

The third case is that of a 40-stamp mill erected in 1903. The mortars and steel battery frame were designed especially for masonry foundations. Each mortar has eight, and each battery-post pedestal six 2-in. anchor bolts. The foundations are of good quality rubble masonry, the top portion being higher grade, with mortar of the proportions 1 cement to 2 sand. The top surface was leveled off with extreme care, using a steel straight-edge. Sheet rubber 1/32 in. thick was placed between the iron and masonry. The mortars fitted perfectly, and the nuts of the anchor bolts were tightened with an 18-in. hammer wrench and sledge. The mill is equipped with 1000-lb. stamps, dropping 8 in., 96 times a minute, and has now been running over two years. Not the slightest movement of any of the mortars or pedestals has been observed, and only one anchor bolt has required tightening. The mortars feel as solid as the rock they rest on, so that pools of water backed up against them will not show a ripple. This state of things is quite a contrast to the mortars swaying from side to side, as they often do on top of wooden blocks. There is the added advantage of having a solid concrete floor around the mortars and under the plates and feeders, so that everything spilled is caught in the floor washings, instead of finding its way into the mortar pits.

The conclusions to be drawn from the above observations are obvious. The masonry must be of good quality, and the top must fit the bottom of the mortar perfectly. The more uneven the surface, the thicker must be the rubber cushion; but it is best to have a smooth surface and thin rubber. If motion once begins, especially if water gets under the mortar, sooner or later the masonry will have to be dressed off to a perfect fit, and grouting will not answer the purpose. The use of anvil blocks under the mortars is not to be recommended. There is apt to be trouble in keeping the mortars from dancing around on top of the anvils. If it is desired to increase the area of contact with the masonry, design a mortar with a larger base, and so avoid a number of extra bolts, which have to be kept tight.

I have not observed and do not believe that solid foundations increase the breakage of stems. If wooden blocks cushion the blow enough to lessen the breakage of stems, they must decrease the crushing duty per stamp, just as running with a shorter drop or greater thickness of ore on the dies will do. The length of time a given set of stems has been in use is the most important factor of their breakage. Start a new mill with new stems and cam shafts, and you have reason to expect practically no breakages for a couple of years, except possibly one or two due to a poor fit of the stem in the boss. From that time on breakage will increase. Loosely fitting guides are to be guarded against in this connection; iron guides bored to fit the stems check the vibration and tend to lengthen the life of the stems.

*Assistant superintendent North Star Mines Company, Grass Valley, California.

Power Plant at the Eustis Mine, Quebec

BY CLAUDE T. RICE

The Eustis copper mine in the province of Quebec has been in steady operation for a number of years. Not long ago an electric plant was installed two miles from the mine, which is operated by water, and which furnishes all the power required for the mill and the mine. This power plant presents a new feature in that two alternators, mounted on the same shaft and driven by turbine water wheels, are run in parallel. The water from the dam is carried by a flume to three pairs of 18-in. special Crocker horizontal turbines mounted on one long shaft, on each end of which is rigidly coupled a rotary field alternator, one 150 kw. in capacity and the other 200 kw. These alternators generate a three-phase 25-cycle 2200-volt current. The effective water head on these turbines is 38 ft., and the shaft rotates at 500 r.p.m. Each pair of turbines is fitted with a separate gate-valve. The gate-valve of the center pair is operated by a hand-wheel, but the other two are operated by Woodward compensating governors. In starting up the hand gate-valve is opened and when the capacity of this pair of wheels is reached the automatic governors are thrown into gear. In this way either one, two, or three pairs of turbines are run according to the amount of power required. This effects a great saving of water, for each wheel is run more nearly at its full capacity.

The fields of both alternators are excited by a 13-kw. generator, which is driven by a belt from a pulley on the turbine shaft. Both fields are in parallel. A Terrill automatic regulator, mounted on the switchboard, and inserted in the fields of the alternators, keeps the current properly distributed between the two alternators and thus the primary voltage is kept constant. A hand rheostat is also in each field circuit, so that the fields can be regulated by hand in case the Terrill regulator gets out of order. A reserve exciter, run by a separate water wheel, is used in case of accident to the other.

When only one alternator is generating a current and it is desired to use both, the field of this alternator is thrown into circuit and when the voltage is equal to that generated by the other machine, the alternator circuit is connected to the generator in step. This type of design obviates the difficulty often attendant upon running alternators in parallel for there is no trouble getting the two alternators in step.

The plant is well constructed upon a foundation of solid rock and it has operated admirably since its first installation. The plant gives a total efficiency, including the transmission circuit, of from 75 to 50 per cent. according to the load. The electric efficiency of the alternators is from 90 to 93 per cent., while that of the waterwheel varies from 80 to 60 per cent. according to the load.

The only difficulty in such a plant is connecting the two alternators in phase. This was done as follows. One alternator was coupled to the turbine shaft. Then the other was lined up with the turbine shaft and the couplings of each brought so near together that they almost touched. The second alternator was run as a synchronous motor and when synchronism was established the faces of the couplings which had been previously blackened by camphor smoke, were scratched with scratch awl drawn rapidly across the two coupling surfaces. Holes were then bored and the alternator rigidly fastened to the turbine shaft. The alternators were then always in phase.

The current is transmitted on three No. 1 bare copper wires. The loss in transmission is about 10 per cent. The telephone wires are mounted on the same holes, but as the telephone wires are transposed every 800 ft. a silent line is obtained.

F. C. Davis erected the electric plant and has been in charge of the electric system ever since.

Paleozoic Strata in Sonora

BY F. J. H. MERRILL.*

Of the geologic formations occurring in Mexico, those of Paleozoic time have remained comparatively unknown, partly on account of the great development of Mesozoic beds which overlie them, and partly because, where exposed, they contain scarcely any fossils. Until within a few years the official expression of the Mexican geologists was, that the only Paleozoic beds in Mexico which could be definitely recognized by their fossils were of Carboniferous age. Fossils of Silurian age, however, from unknown Mexican localities, existed in some collections. In 1900, Prof. E. T. Dumble, published in the *Transactions* of the American Institute of Mining Engineers, Vol. XXIX, the notes of a visit to Sonora in which he stated that near the Trigo mine, north of Alamos, he had found outcrops of a limestone containing Paleozoic corals of the genera Cyathophyllum and Heliolites, thus fixing the age of these beds as Silurian or Devonian. This important discovery has remained for several years the only direct evidence of the exposure of the older Paleozoic beds.

The Paleozoic limestones which carry copper at Bisbee, Arizona, are well developed in northern Sonora but the occurrence of fossils in them within the Mexican border has not been recorded.

In 1904 the Instituto Geologico de Mexico sent one of its geologists, Dr. Ernest Angermann, to verify Professor Dumble's observations. His report appears in the *Boletino* del Secretario de Fomento Año IV, No. 7, Fol. IV, 1905, and may be summarized as follows: Dr. Angermann succeeded in finding only the first of Professor Dumble's two localities of fossils, one of which was at the Trigo mine, and one about two miles northeast of Casita. He reports, however, two additional localities in that immediate neighborhood.

In the valley of the Cedros river, a branch of the Mayo, about 25 miles northwest of Alamos, is a village named Casita. About 8 km. south of this place, and west of the road which leads from Casita to Conicari, is a rounded hill composed of quartzite, quartzose conglomerate and limestone. The last is light blue and reddish gray, semi-crystalline and fossiliferous. Its strike is north and south; its dip vertical. From this limestone, which contained many traces of fossils, was collected a brachiopod, which, although much altered by metamorphism, was identified as most probably of the genus Spirifer, Sow.

Although the lack of specific identification renders impossible the assignment of systematic age to these limestones the observations of Dr. Angermann confirm the conclusion of Professor Dumble, that Paleozoic strata are extensively exposed in southern Sonora.

*Consulting geologist, 225 West End Ave., New York City.

The Wingate Explosion

A disastrous explosion occurred at 11.40 p.m. on Sunday, Oct. 14, at the Wingate Grange colliery, by which 24 men lost their lives. Wingate colliery is situated in Durham, England, not far from the Seaham collieries, where explosions occurred in 1871 and 1880. The colliery was opened 63 years ago, and employs upward of 1000 men. There are two shafts from which five seams are worked. The Low Main coalseam, in which the explosion occurred, is 708 ft. deep. So far as can at present be ascertained, the explosion occurred not far from the Lady shaft, and the men in the more distant districts were uninjured. It was fortunate that few miners were in the workings at the time of the accident or the loss of life would have been much greater.

A curious circumstance in connection with the disaster was that six ponies were found wandering about the workings alive. All the rest, numbering between 70 and 80, were found dead in the stables. Apart from the damage to the shafts, the effects of the explosion were not exceptionally violent.

In Kansas, Oklahoma and Indian Territory, large and prolific gasfields are being opened up within the oil bearing formations. This gas is produced from sand rock in all respects similar to that of the Appalachian field, with the probabilities of an extensive and continuous supply.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Electric vs. Air Drills

The continued discussion in your paper on Electric vs. Air Drills is of considerable interest to those connected with South African mining, as it bears on the question, ever present with us, of cheaper stoping by the increased use of machine drills of a suitable type. The margin of profit often depends upon keeping the blasting operations within the narrow limits of the reef walls, to the exclusion of the barren country rock, and machine drilling today is responsible for a great deal of waste now broken and brought to the surface.

Thus far the correspondence appears to show that under certain conditions the electric drills can work more speedily and with greater economy of power than the air drills; but the facts that bear most strongly against the electric type are their unhandiness, owing to excessive weight, and their increased liability to breakage, owing to their more delicate mechanism.

Now, for efficiency in machine stoping on the Rand, handiness as given by light weight is a considerable item in reducing the cost of the labor employed to run the drill, and immunity from constant internal breakage is also an important item. The drill must be able to stand the moderately rough usage and jars which necessarily take place under ordinary working conditions of metal mining.

Perhaps some of your readers can give instances of the efficiency and staying power of smaller and more easily handled drills of both types than those which have thus far been included in the discussion.

HUGH F. MARRIOTT.

London, England, Oct. 6, 1906.

Depreciation of Copper Smelting Plants

The question has been asked, what is the proper allowance for depreciation in a copper-smelting plant?

In my opinion, a modern copper-smelting plant, consisting of the following departments—concentrating, roasting, reverberatory smelting, blast-furnace smelting, converting, steam and electric power plants—with the necessary shops, etc., should last 20 years, providing repairs are kept up in good style; consequently there should be written off for depreciation, yearly, 5 per cent. of the original cost of the plant.

It has been frequently stated that smelting plants should not be considered to have a life to exceed 10 years, which would necessitate the writing off, for depreciation, of 10 per cent., per annum, of the original cost. However, modern plants are so kept up that this figure is too high for depreciation, and the figure given above is ample.

In this connection it may be of interest to mention that in figuring the cost of a smelting plant a great many items of expense will yield no salvage should the plant be dismantled. The following may be mentioned as being the principal items of expense: Lands, buildings, engineering expenses, interest, machinery and the installation of same. I have recently had occasion to go very thoroughly into the matter of salvage obtainable from dismantling smelting plants and the following results will give some idea of the values recoverable from a typical concentrating and smelting plant for copper, if dismantled: 44 per cent. of the equipment would yield no salvage; 2 per cent. would yield 2 per cent of its original cost; 11 per cent. would yield 5 per cent. of its original cost; 37 per cent. would yield 10 per cent. of its original cost; 2 per cent. would yield 15 per cent of its original cost; 2 per cent. would yield 20 per cent. of its original cost; 2 per cent would yield 25 per cent. of its original cost; 100 per cent. would yield 5.49 per cent.

E. P. MATHEWSON,
Manager, New Reduction Works,
Anaconda Copper Mining Company.
Anaconda, Montana, Oct. 5, 1906.

Placer Mining and Vein Mining

On page 252 of his second edition of "The Gold Mines of the World," J. H. Curle says: "Hydraulic mining is a distinct art. To my mind the laying out of an hydraulic mine is a greater test of capacity than the opening of a quartz mine." Mr. Curle is a keen observer, whose judgment is only formed as the result of seeing things, and his statements are most conservative. Hence it does me, a placer miner, a certain amount of good to quote these sentiments after a heated argument with a vein miner on the respective engineering requirements for opening and operating placer and vein mines.

I have found a general, but mistaken, sentiment that vein mining is pre-eminent in requiring the highest grade of engineering skill. This is very well illustrated by looking into the curricula of the various mining schools of this and other countries, where it will be found that in some of them no placer mining is taught at all, while in others, such as the one I attended, it was treated only superficially and dismissed as unimportant after a few lectures.

Now this is all wrong and I raise my voice, not as an apostle of discontent, but as one who echoes Mr. Curle and as one who wishes to call attention to the general mistake made in neglecting to realize the importance of the engineering of placer mines.

Is there anything requiring greater skill, experience and judgment than the investigation of a placer deposit with the idea of ascertaining its fitness for working by the hydraulic method? Assume a deposit containing 50,000,000 cu.yd. of alluvial gravel of a depth of more than 300 ft. Is it not more difficult to ascertain the average value of this deposit, consisting as it may of auriferous bedrock and gravel, barren sand, clay, and lava or tufa cap, and covering hundreds of acres, than it is to sample a vein? Is there any problem in vein mining of similar magnitude to opening this deposit so as to dispose of the tailing in such a way as to allow exploiting all of it at a rapid rate, but without so filling up the dumping ground as to cause difficulties? What is more difficult than reservoiring and transporting many miles over the rugged topographic features found in hydraulic-mining regions more than 100 sec. ft. of water for working the mine? And after all the installation is made, and the mine opened, is there more opportunity for keen judgment and engineering skill in operating so as to handle thousands of cubic yards per day in the right way when one cent per cubic yard is often the margin between profit and loss?

The problems of drift-gravel mining are also difficult. Is it simple to investigate a property with its valuable content buried under hundreds of feet of material, where an intricate system of channels of different geologic ages and consequent varying characteristics may exist in a complicated plexus? Is greater knowledge of geology required in any vein mining than is needed in the reconnaisance of many square miles of territory and the particular investigation of its rocks to determine with accurate cross-sectioning where a long tunnel shall be located so as to tap the deposit at a depth below bed-

rock, but not so deep as to make long upraises necessary?

Is greater skill required than in mining auriferous gravel where every foot of ground must be closely timbered, where swelling bedrock breaks any timbers, where long tunnels must be maintained?

The problems of gold dredging are not easy and there is much to solve. The difficulty of ascertaining the average value of a deposit exists and one has but to recall the startling incongruities when prospecting and dredging values were compared a few years ago to realize that, though the work had been done carefully by good men, the inherent complexities of the investigation caused the trouble. Is any greater degree of mechanical skill required in any mining than in dredging auriferous alluvion, where wear and tear is so great?

Placer mining is essentially the exploitation of large volumes of low-grade material. Therefore in all its branches the best management is necessary to success. It also consists in taking every advantage of natural occurrences, making every feature a helpful one, every obstacle a minimum impediment. It includes, therefore, problems of great magnitude and minute ramification and requires a broad practical knowledge and ripe experience. The dismal failures of men not versed in placer mining even when working rich alluvial properties is ample testimony to these requirements.

One way of judging is by scanning the work done by men whose first mining experience was that acquired in placer mining.

The big work in the Transvaal was done by such men. The diamond mines in South Africa are made more lucrative by Californian men and methods. I attribute their success in vein and diamond mining largely to their early training. Another way of judging is by seeing what placer miners have evolved in the way of mechanical improvement and invention. Look into the realm of hydro-electric devices and how obvious is the result!

Now, my brother engineers who delve in veins, and my professorial friends who make curricula, give the generally neglected art of placer mining an importance commensurate with its real difficulties, for there are greater problems and refinements in placer mining than in any vein mining.

J. P. HUTCHINS.

New York, Oct. 12, 1906.

A pipe line for conveying petroleum on the Isthmus of Panama, has been completed by the Union Oil Company, of Los Angeles, Cal. The line is 45 miles long and will convey California petroleum, carried to Panama by tank steamers. The daily consumption is expected to amount to 3000 bbl., as the Panama Railroad and the power and electric plants of the Isthmus will convert their coal furnaces to oil burners.

New Publications

"Teoria para un Elevador de Agua." By Manuel José Quiroga. Pp. 31; illustrated. 6½x10 in.; paper. Buenos Aires, 1906: Imprenta de la "Revista Técnica."

"The Manufacture of Coke in 1905." By Edward W. Parker. Extract from "Mineral Resources," United States Geological Survey. Pp. 56, 6x9 in.; paper. Washington: Government Printing Office.

"Record of Deep-Well Drilling for 1905." By Myron L. Fuller and Samuel Sanford. U. S. Geological Survey, *Bulletin* No. 298. Pp. 299. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Elements of Mechanical Drawing in Two Parts. Part I for Beginners. Part II, Problems in Descriptive Geometry." By Alfred A. Titsworth. Pp. 130; illustrated. 7x10 in.; cloth, $1.25. New York, 1906: John Wiley Sons.

"Report on Progress of Investigations of Mineral Resources of Alaska in 1905." By Alfred H. Brooks and others. Bulletin No. 284, U. S. Geological Survey. Pp. 169; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Resistance of Tubes to Collapse." By A. P. Carman and M. L. Carr. University of Illinois Engineering Experiment Station, Bulletin No. 5, June, 1906. Pp. 26; illustrated. 6x9 in.; paper. Urbana, Illinois; 1906: Published by the University.

"Ore Deposits of the Silver Peak Quadrangle, Nevada." By Josiah Edward Spurr. U. S. Geological Survey, *Professional Paper* No. 55. Pp. 174; 24 plates, 40 figures and geological map. 9x12 in.; paper. Washington, 1906: Government Printing Office.

"Northern Territory of South Australia, Northwestern District. Reports (Geological and General) Resulting from the Explorations Made by the Government Geologist and Staff During 1905." Pp. 53; illustrated. 9x13 in.; paper. Adelaide, 1906: C. E. Bristow, Government Printer.

"Reconnaissance of Some Gold and Tin Deposits of the Southern Appalachians." By L. G. Graton. With "Notes on the Dahlonega Mines." By Waldemar Lindgren. United States Geological Survey, Bulletin No. 293. Pp. 136, illustrated, 6x9 in.; paper. Washington: Government Printing Office.

"The Auriferous Deposits and Mines of Menzies, North Coolgardie Goldfield." By Harry P. Woodward, Assistant Government Geologist. Western Australia Geological Survey, Bulletin No. 22. Pp. 92, with two maps and six plates of sections; illustrated. 6x9 in.; paper. Perth, 1906: A Curtis, Acting Government Printer.

"Mines and Quarries: General Report and Statistics for 1905." Part II.—Labor. General report and statistics relating to persons employed and accidents at mines and quarries in the United Kingdom, and to the enforcement of the mines and quarries acts. Pp. 76; illustrated. 8½x13 in.; paper, 10d. London, 1906: Wyman & Sons, Ltd., Fetter Lane, E. C.

"The Production of Coal in 1905." By Edward W. Parker. Extract from "Mineral Resources," United States Geological Survey. Pp. 268, 6x9 in.; paper. Washington: Government Printing Office.

In addition to the usual statistical matter the report gives a number of pages on tests of coal from different States, made in the testing plant of the survey at St. Louis.

"American Stationary Engineering." By W. E. Crane. Pp. 288, illustrated, 5½x8 in.; cloth, $2. New York, 1906: The Derry Collard Company.

This is a plain, practical book on the care and management of steam engines, boilers and their connections. It is clearly written and contains many valuable hints, drawn from long experience in the engine room.

"Summary Report of the Geological Survey of Canada, 1905." Robert Bell, acting director. Pp. 144, with maps and illustrations, 6½x10 in.; paper. Ottawa, Canada: Public Printer.

This is the condensed record of the work done by the Geological Survey of Canada during the year of 1905; with brief preliminary notes of the explorations made and their results.

"Clays, Their Occurrence, Properties and Uses, with Especial Reference to Those of the United States." By Heinrich Ries. Pp. 490; illustrated. 6x9 in.; cloth, $5 net. New York, 1906: John Wiley & Sons.

Contents: Origin of clay. Chemical properties of clay. Physical properties of clay. Kinds of clay. Methods of mining and manufacture. Distribution of Clay in the United States: Alabama—Louisiana, Maine—North Carolina, North Dakota—Wyoming. Fullers' earth.

"Preliminary Report on the Operations of the Fuel-Testing Plant of the United States Geological Survey at St. Louis, Mo., 1905." Joseph A. Holmes in charge. U. S. Geological Survey, Bulletin No. 290. Pp. 240 6x9 in.; paper. Washington, 1906: Government Printing Office.

Contents: Introduction by J. A. Holmes. Field work, by E. W. Parker and J. S. Burrows. Work of the chemical laboratory, by N. W. Lord. Washing tests, by A. W. Belden. Briquetting tests, by L. P. Breckenridge. Producer-gas tests, by Robert H. Fernald. Coking tests, by A. W. Belden Briquetting tests, by J A. Holmes. Detailed report of tests. Index.

"The Principles and Practice of Surveying." By Charles B. Breed and George

L. Hosmer. Pp. 548, illustrated, 6x9 in.; cloth, $3. New York, 1906: John Wiley & Sons.

This book is divided into four parts. Part I is on the use, care and adjustment of instruments. Part II describes surveying methods. Part III treats of computations, and Part IV of plotting. The usual tables of logarithms, sines, tangents and other formulas are appended. The book is a comprehensive and thorough treatise on the principles of surveying and the more elementary practice. It will serve well either as a textbook or as a reference for surveyors at work.

"The Building and Ornamental Stones of North Carolina." By Thomas L. Watson and Francis B. Lamy, with the collaboration of George P. Merrill. Bulletin No. 2, North Carolina Geological Survey. Pp. 304, illustrated, 7x10 in.; cloth. Raleigh, N. C., 1906: State Printer.

This is a preliminary report on the great variety of stones useful for building, decorative and road-making purposes in North Carolina. The State is well supplied with these, including granite, marble, limestone, sandstone and many subordinate varieties. The report is the result of nearly three years spent in field work and constitutes an interesting and valuable study in economic geology. Much attention is also paid to the practical side and to quarrying and use of stones.

"Transactions of the Australasian Institute of Mining Engineers, Volume XI." Edited by A. S. Kenyon, Secretary. Pp. 196, 37 plates. 5½x9 in.; paper. Melbourne, 1906: Published by the Institute.

Contents: The development of pyritic smelting (presidential address), by Robert C. Sticht. Erection of a steel chimney, by James Hebbard. Filter press treatment of slimes, by H. R. Edmands. Work and methods at the Yelta copper mine, South Australia, by L. G. Hancock. The cyaniding of refractory tailings on the Witwatersrand, by W. H. C. Lovely. Hydraulic suction elevator, by D. B. Waters. Geology of the Peaks silver field, with special reference to the ore deposits, by C. O. G. Larcombe. The science of economically mining hard ground with percussive rock drills and compressed air, by W. A. T. Davies. Concentration of silver-lead ores, by V. F. Stanley Low. The Clarendon phosphate deposits, near Dunedin, New Zealand, by Arthur Andrew.

"Transactions of the Institution of Mining and Metallurgy." Fifteenth Session, 1905—1906, Vol. XV. Pp. 659; illustrated. 6x9 in.; paper. London, 1906: E. & F. N. Spon, Ltd., and the Institution of Mining and Metallurgy. New York: Engineering and Mining Journal.

Contents: The treatment of tin-wolfram-copper ores at the Clitters United mines, by F. Deitzsch. The occurrence of gold in Upper Sarawak, by J. S. Geikie. The computation of assay values, by William Crosley. A graphic calculator, by William Crosley. Ore Valuation of a Witwatersrand mine, by E. J. Way. The occurrence and treatment of gold ores at Bidi, Sarawak, Borneo, by T. C. Scrutton. The occurrence and extraction of gold in Sarawak, Borneo, by W. Hamilton. Gold mining in Japan, by A. R. Weigall. Metals and their ferro-alloys used in the manufacture of alloy steels, by O. J. Steinhart. Pyritic smelting by Rupert C. Alabaster and F. H. Wintle. The Acme combined concentrating table, by L. H. L. Huddart. Stadia in careful work, by Alfred H. Webb. The detailed mapping of stoping areas, by H. R. Sleemen. Sinking, development, and underground equipment of deep-level shafts on the Rand, by Arthur E. Pettit. The hydraulic filling of a coal seam at Lens, Pas de Calais, France, by L. E. Hill and Malcolm Butt. A record of investigation of earth temperatures on the Witwatersrand goldfields, and their relation to deep-level mining in the locality, by H. F. Marriott. The ammonia-copper-cyanide process, by E. Le Gay Brereton. The cyanide treatment of cupriferous tailings by the sulphuric acid process, by W. S. Brown. The bucket-dredging industry, by E. Seaborn and G. N. Marks. The assay of auriferous tinstone, by C. O. Bannister. The use of the impact screen in tin dressing, by J. H. Collins. The Mitchell's Creek gold mines, New South Wales, by Wilfred F. Macdonald. A prospecting shaft in the Goldfield district, Goldfield, Nevada, by E. A. Collins. The production of high-grade gold bullion from zinc-box precipitates, by C. J. Morris. Chert Mining in England and Wales, by H. L. Terry. The Ancient Auriferous Conglomerates of Southern Rhodesia, by J. W. Gregory. Huntington mill notes, by C. E. Parsons. A new form of platinum parting apparatus, by A. Jarman. Some copper deposits in Rhodesia, by C. Brackenbury.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Oct. 30, 1906.

APPARATUS FOR MANUFACTURING PRODUCER GAS—William H. Adams and Frederick Powell, Portland, Oregon, assignors of twenty-five one-hundredths to said Adams, fifteen one-hundredths to said Powell, and sixty one-hundredths to The Ladd Metals Company, Oregon. No. 834,238. Filed June 30, 1904.

PROCESS OF SMELTING—William H. Adams and Frederick Powell, Portland, Oreg., assignors of twenty-five one-hundredths to said Adams, fifteen one-hundredths to said Powell, and sixty one-hundredths to The Ladd Metals Company, Oregon. No. 834,240. Filed July 16, 1904.

CENTRIFUGAL SEPARATOR—Nils S. Boek, Stockholm, Sweden. No. 834,254. Filed May 3, 1905.

DEHYDRATING APPARATUS — Ernest W. Cooke, New York, N. Y., assignor, by mesne assignments, to The Cokel Company, New Jersey. No. 834,265. Filed Jan. 29, 1904.

STAMP MILL—Peter Kirkegaard, Deloro, Ontario, Canada. No. 834,385. Filed Sept. 17, 1904.

MILL FOR CRUSHING AND GRINDING—George C. Little, Jamestown, N. Y. No. 834,387. Filed Dec. 19, 1904.

ROCK DRILL—Thomas E. Adams, Cleveland, Ohio. No. 834,441. Filed July 29, 1905.

ROCK-DRILLING MACHINE OR ENGINE—Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. No. 834,522. Filed Jan. 11, 1905.

PRECIPITATING CELL—Wilbur A. Hendryx, Denver, Colo. No. 834,575. Filed Jan. 17, 1906.

DRIER FOR CLAY PRODUCTS—Robert W. Lyle, New York, N. Y. No. 834,584. Original application filed Nov. 10, 1904. Divided and this application filed Feb. 25, 1905.

ORE SEPARATOR—John Gottlander, Denver, Colo. No. 834,613. Filed Nov. 20, 1902.

PROCESS OF TREATING ORES—Frederick T. Snyder, Oak Park, Ill. No. 834,644. Filed June 21, 1905.

METALLURGICAL PROCESS FOR THE EXTRACTION OF METALS FROM THEIR ORES AND THE CONVERSION OF IRON INTO STEEL—George H. Benjamin, New York, N. Y. No. 834,656. Filed Dec. 26, 1902.

PROCESS AND APPARATUS FOR SEPARATING METALS AND ORES — Telford Groesbeck, Cincinnati, Ohio. No. 834,722. Filed Dec. 26, 1905.

SMELTING FURNACE—Frederick L. McGahan, St. Louis, Mo. No. 834,747. Filed June 28, 1905.

COAL-HANDLING IMPLEMENT—Nelson E. Watson, Galeton, Pa. No. 834,780. Filed March 20, 1906.

APPARATUS FOR RECOVERING METALS. Wilbur A. Hendryx, Denver, Colo. No. 834,803. Original application filed June 30, 1905. Divided and this application filed Jan. 17, 1906.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Oct. 20, 1906.

ELECTRIC WELDING—A. F. Rietzel, Lynn, Mass., U. S. A. Improved system of electric welding, intended specially for welding thin sheets of metal face to face. No. 18,909 of 1905.

CHEMICAL PROCESS—C. S. Bailey, London. Introducing ammonia and other nitrogen compounds produced by the distillation of coal, etc., into the soda and hydrogen produced by the electrolysis of salt, so as to produce sodium nitrate. No. 19,181 of 1905.

COAL APPARATUS—G. Gibb and S. M. Mavor, Glasgow, Scotland. Improvements in the traveling carriages of coal cutters used in longwall mining. No. 19,327 of 1905.

SMELTING PROCESS—T. J. Heskett, Brunswick, Australia. A smelting process intended for reducing metals from complex sulphides, by which the most volatile metals are reduced first. No. 26,980 of 1905.

PRODUCTION OF CHROMIUM — Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Improved method of contnuously producing chromic acid by the electrolysis of solutions of lower oxygen compounds of chromium. No. 26,009 of 1905.

METALLURGICAL PROCESS—A. M. Day, Salt Lake City, U. S. A. Improvements in smelting and converting processes, in which silica and other materials are injected into the charge by an air blast independent of the main air blast used in reducing the charge. No. 3528 of 1906.

METHOD OF ROASTING—L. Brunet, Paris, France. An improved method of roasting complex zinc ores so that sulphate of zinc is formed; then dissolving out with sulphurous acid and acting on barite so as to produce a lithopone paint, consisting of sulphite of baryta and oxide of zinc. No. 4199 of 1906.

WOODEN SIEVES—J. Hargreaves, Farnworth in Widnes. Improved form of wooden sieves for separating crystals of salts from their solutions. No. 7771 of 1906.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments. Address all reples to Box 183, plication

Sam T. Godbe, of Los Angeles, was in Salt Lake recently.

T. A. Jones, of Albuquerque, N. M., recently inspected mining property in Taos county in that Territory.

John A. Church is at present in the City of Mexico. He will return to New York early in December.

Henry Z. Osborne has returned to Los Angeles, Cal., from a trip to Tonopah and Goldfield, Nevada.

D. H. Lawrance, of Breckenridge, Colo., is making extended surveys of the Victoria mine, near that town.

E. T. Mixer, of Salt Lake City, recently visited the property of the Champion Mining Company, near the White Knob mines, Mackay, Idaho.

W. H. Bradley, of Chicago, and W. Henry Harris, of Indianapolis, Ind., have been visiting the Rock Creek district, near Baker City, Oregon.

Fred W. Parker and B. Colby, of New York, are inspecting mining ground in Butte in the interest of themselves and New York associates.

Wm. A. Farish, Jr., has resigned as superintendent of the Sierra Consolidated Gold Mining Company's properties at Hillsboro, New Mexico.

H. W. Hardinge, formerly of Denver and now of New York, has just returned from the Cobalt district in Ontario, of which he speaks favorably.

E. P. Jennings, of Salt Lake City, has returned home from a three months' stay in the Lake Superior region, Michigan. He also spent a month in Colorado.

The offices of F. W. Bradley, John H. Mackenzie and the Bunker Hill & Sullivan Mining and Concentrating Company are now located at 1611 Franklin street, San Francisco.

Robert C. Morris, who was appointed receiver for the property of the Montana Zinc Company, in Butte, Mont., by the United States court in New York a short time ago, arrived in Butte on Oct. 30 to look after the company's affairs.

Henry M. Payne, of Williamson, W. Va., has been elected general superintendent and chief engineer of the Mingo Block Coal Company, and will close his present business on December 1, to assume control of the company's operations.

Wiliam M. Courtis, of Detroit, Mich., has been examining several properties at Basaitegue, near Cananea, Mexico, including the Detroit & Sonora, the Picacho and the Oro Maximo. The examination was in the interest of Detroit stockholders. David Ward, of Detroit, accompanied Mr. Courtes.

J. F. Healy, general superintendent of the Davis Coal and Coke Company for the past four years, resigned Oct. 1 to accept the position of general manager of the operating department of the Davis Colliery Company, of Elkins, W. Va. The latter company intends to open several mines locatel along the route of the Coal & Coke Railroad.

A. B. Wolvin, who is largely identified with the iron and shipbuilding interests of the Lake country, spent a few days in Butte, Mont., recently, looking over the property of the Butte & Superior Company, with which he is also identified. He was accompanied by J. F. Killorin, I. Friemuth and F. J. Davis, of Duluth, and C. H. Nelson, of Hibbing.

Obituary

Cavaliere Mario Michela, president of the Societa Italiano di Elettrochimica, died in Rome, Italy, Oct. 10. His standing in Italy was high, and his death is much regretted.

Lewis G. Jenks, recently appointed superintendent of the ore properties of the Republic Iron and Steel Company, on the Mesabi range, died suddenly, Oct. 21, from heart failure. He was a native of Indiana, and had been connected with the company for a number of years.

Societies and Technical Schools

Massachusetts Institute of Technology—Prof. Andrew Fleming West, of Princeton, has decided not to accept the position of president of the institute, which was recently offered to him.

Zeehan School of Mines and Metallurgy—This technical school on the west coast of Tasmania offers courses of instruction in mining and ore treatment, together with the branches of pure science most closely bearing upon these arts. The school is supported by public subscription, aided by grants from the government. The courses seem to be thorough, and are skilfully adjusted. Day and night sessions are maintained, in duplicate, for the sake of those students who work by day in the neighboring mines. The school is located in an active mining region, and practical observation forms a large part of the required work. The tuition fees are exceedingly moderate.

Michigan College of Mines—The first annual convention of the Sigma Rho fraternity of the Michigan College of Mines will be held in Chicago and Milwaukee on Jan. 3, 4 and 5, 1907. An important feature of the meeting will be the formation of the alumni of the fraternity into an alumni association. Various plants and works, which appertain to mines, mining, and the manufacture of mining machinery, will be visited by the convention during its three days' session.

The committee on convention hopes to secure as large an attendance as possible, in order that the association may outline a policy which will meet with general approbation and which will be followed by success.

Harvard University—The Department of Mining and Metallurgy of Harvard University, Cambridge, Mass., offers courses leading to the degrees of Bachelor of Science, Engineer of Mines, and Metallurgical Engineer. The courses are given in connection with the Lawrence Scientific School and include all the theoretical and laboratory work essential to professional education in this line. The laboratories in the Rotch building are fully equipped for their work. This is supplemented by a required amount of field work which is done during the summer. The entrance requirements are the same as those for Harvard University. The annual tuition fee is $150, exclusive of laboratory fees, which range from $5 to $30, according to the courses pursued.

Industrial

The Jeffrey Manufacturing Company, Columbus, Ohio, has established a new Canadian branch office in Montreal, Canada, at Lagauchetiere and Coté streets.

The Link-Belt Company has recently opened an office at No. 913 Missouri Trust building, St. Louis. E. C. Berghoeffer, an engineer of long experience with the Chicago house of the company, is in charge.

The Universal Portland Cement Company has placed a large order with the Kent Mill Company for pulverizers for the new plants at Buffington, Ind., and Pittsburg, and to be substituted for ball mills in the Illinois Steel Company plant. The Chicago Portland Cement Company has ordered several Kent mills for the addition which they are building to their plant at Oglesby, Ill. The new cement plant at Mason City, Iowa, is to be equipped with Kent mills.

The Garvin Cyanide Extraction Company, which has its principal office at 186 Morrison street, Portland, Oregon, has secured the contract for the erection and installation of a Garvin electro-cyanide and amalgamating plant of 100 tons daily capacity, at the Sunnyside mine near Roosevelt, Idaho. The results of the test are interesting because of the satisfactory extraction accomplished. Besides the Sunnyside plant, the Garvin Company is building a plant of 40 tons daily capacity for the Minerva Mining Company, at Atlanta, Idaho; one of 300 tons daily capacity for the Palmer Mountain Tunnel Company, at Loomis, Wash.; and a 10-ton plant for Hamilton Brothers, Myrtle Creek, Oregon.

On September 11, the Joshua Hendy Machine Works, of San Francisco, in-

corporated since 1882, was merged into a new corporation, known as the Joshua Hendy Iron Works. The company, despite the disaster of April, finds itself with an increased capital stock of $1,000,000 to continue its business operations. On the old site at 75 Fremont street, there is being erected a two-story building, 91½x137½ ft., a permanent structure to house the offices and salesrooms. This will be the first permanent building erected in that part of the burned district. The temporary offices and shops on the old site at Bay, Kearny, and Francisco street, are to be abandoned on Dec. 1. The manufacture of machinery will proceed in the new works nearing completion at Sunnyvale, in Santa Clara county. The company recently acquired a large tract of land at Sunnyvale, about 10 miles north of San Jose on the coast line of the Southern Pacific railroad. The machine-shop is 420 ft. long and 80 ft. wide. The foundry building is 300 ft. long and 60 ft. wide, with a daily cupola capacity of 30 tons. The blacksmith-shop and boiler-shop exceed 200 ft. in length and are about 50 ft. wide; the pattern-storage building is a two-story brick structure of fire-proof construction; nearly adjoining it are the carpenter and pattern shops; the office or administration building is constructed of reinforced concrete, two stories high, 120 ft. long, and 40 ft. wide, the upper story of which will be used to house the engineering and drafting departments of the company. The buildings are arranged in a quadrangle. The machinery is all new, the previous equipment of the company having been totally destroyed in the fire; every machine will be operated directly and independently by electricity.

Trade Catalogs

Receipt is acknowledged of the following catalogs and circulars:

T. H. Proske, Denver, Colo. The Ajax Junior Drill Sharpener; Pp. 12, illustrated; paper, 8x5 in. 1906.

Charles E. Sholes Company, New York City. "Things Chemical," October, 1906. Pp. 16, paper, 6x9 inches.

Colwell Lead Company, New York City. Catalog "D," Lead Goods; Pp. 60, illustrated; paper, 5x7 in. 1906.

Detroit Lubricator Company, Detroit, Mich. Catalog, 1906. Sight-Feed Lubricators; Pp. 64, illustrated; paper, 6x8 in. 1906.

Baldwin Locomotive Works, Philadelphia, Penn. Record of Recent Construction; Bulletin No. 59; Pp. 32, illustrated; paper, 6x9 in.; 1906.

B. F. Sturtevant Company, Hyde Park, Mass. Catalog No. 140, Sturtevant High Pressure Blowers; Pp. 48, illustrated; paper, 6½x9 in.; 1906.

The Cincinnati Milling Machine Company, Cincinnati, Ohio. Examples of Rapid Milling; Pp. 64, illustrated; paper, 6¼x9¼ in.; 1906.

Northern Electrical Manufacturing Company, Madison, Wis. Bulletin No. 50A, Northern Spherical Machines; Pp. 24, illustrated; paper, 5x9 in.; 1906.

The Risdon Iron Works, San Francisco, Cal. Bulletin Nos. 19-1 and 19-2, Silver-Lead and Copper Blast Furnaces respectively; Pp. 4, illustrated; paper, 7x10 in.; 1906.

Electro-Dynamic Company, New York City. Inter-Pole Motors. Pp. 16, paper, 6x9 in. 1906. Also Circular No. 23. Inter-Pole Motors. Pp. 8, illustrated, paper, 6x9 in. 1906.

Joseph Dixon Crucible Company, Jersey City, N. J. Graphite as a Lubricant; Pp. 84, illustrated; paper, 6x9 in. 1906. Also Steam Traps, by W. H. Wakeman; Pp. 32, illustrated; paper, 5x7 in. 1906. Also Air Compressor Lubrication; Pp. 24, illustrated; paper, 6x8 in. 1906.

Construction News

Maitland, South Dakota—It is proposed to put up a 200-ton cyanide plant at the Minnesota mine.

Custer, South Dakota—The question of putting up a mill at the Ideal mine near Custer, is under consideration.

Lead, South Dakota—The Victoria Extension mine is to be supplied with a tramway 1½ miles long to the Victoria mill. Freeman Steele is superintendent.

Grass Valley, California—The Gold Flat mine is to be equipped with an air compressor and other machinery. Joseph Weisbein is president, and W. P. Martin superintendent.

Greenhorn District, Oregon—The owners of the Belcher mine propose putting in 20 stamps additional to the present 20-stamp mill. M. A. Dehuff, Spokane, Wash., has charge.

Frisco, Colorado—A new hoist, pumps and other machinery are to be put in at the Victoria mines. David H. Lawrance, Breckenridge, Summit county, Colo., is consulting engineer.

Hastings, Ontario—The American Madoc Mining Company is preparing to increase the mining plant at its mines; also to put up works for making sulphuric acid. The company's works are at Bogart, Hastings county, Ontario.

Platteville, Wisconsin—A concentrating plant is to be put in at the Hibernia property. J. W. Murphy is in charge.

At a recent meeting of the directors of the O. P. David Mining Company, it was decided to let a contract for the erection of a concentrating plant at the mine. The ground is being developed as rapidly as possible, and there is now on the ore dump on top some 250 tons of mill dirt that is variously estimated as running from 20 to 30 per cent. zinc.

Special Correspondence

San Francisco Oct. 31

While the State of California did not produce as much mineral wealth in 1905 by several hundred thousand dollars, as was the case the preceding year, yet the total amount for the year is $43,069,227, of which $19,000,000 was in gold. Formerly copper came next to gold in total annual value, but now the petroleum amounts to over $9,000,000 a year, while the copper values do not reach $3,000,000. Among other things the State produced last year over $3000 worth of platinum and $18,800 worth of tungsten; and the gems, including tourmaline, turquoise, kunzite, chrysoprase, etc., were valued at nearly $150,000. Of petroleum the total number of barrels produced was 34,275,701, which is more than the output of any other State in the Union and is 4,537,698 barrels more than the year 1904. Very much more attention than formerly is being paid to the structural materials such as cement, clays, sandstone, granite, marble, limestone, etc. California made 1,265,000 barrels of cement in 1905 and the record of 1906 will show half as much again. The State is doing very well with its mineral industries, and, though it is likely to be eclipsed in gold output by Nevada very shortly, as it has been by Colorado, it will be some time before the former State will catch up in the matter of total annual value of mineral substances.

Constitutional amendment No. 20 to be voted for at the coming election, will, if carried, permit all mining and other corporations whose charters are about to expire by the 50-year limitation prescribed by law, to extend their corporate existence for another 50 years by the simple and inexpensive process of filing with the proper officials a certificate of intention to do so. All that is required is the vote or written consent of two-thirds of the stock, or two-thirds of the members. The matter is of pressing importance to the California banks, whose original charters will expire in from five to eight years. The same is the case with many of the older mining companies of the State. Hundreds of California corporations were organized between 1856 and 1865 under the first statutes on corporations, for a period of 50 years. They are nearing the end of their legal existence and unless this amendment is adopted will have to wind up their business and dissolve through expensive and vexations court proceedings. The amendment will not extend any of the franchises granted to incorporations, nor increase corporate power or rights. It will simply prolong the lifetime of corporations that wish to continue to exist.

The shovelers, who are members of the Grass Valley Miners Union, have presented a resolution in that body calling for an advance in pay. They are now receiving $1.75 per day and upward. The opinion

of the mine-owners has not been asked and no one knows as yet whether a strike will ensue in case the raise is refused.

Judge Harrier, of Solano county, has rendered his decision in the case of Solano county against the Selby Smelting and Lead Company and granted the plaintiff a permanent injunction by issuing an order restraining the defendant from so operating its plant as to permit fumes to reach the Benicia side and destroy vegetation and injure live stock. The Court grants the injunction as prayed for in the complaint. The Selby works are on the bay shore of Contra Costa county, below Vallejo Junction, and on the opposite side of Carquinez straits from Solano county. It was charged, however, that the fumes were blown across the straits to Benicia and thereabouts and did the damage complained of. The Selby company will appeal the case. Meantime it is building a large smelting plant on the bay shore at San Bruno point, south of San Francisco in San Mateo county, where there are five or six miles of the salt water of San Francisco bay to leeward of them during the prevailing winds of the region.

Salt Lake City Nov. 3

The ore and bullion settlements for the past week amounted to $924,000, while the sales of stocks on the Salt Lake Stock and Mining Exchange during the same period amounted to 293,593 shares for $161,710.

Activity still continues in the Gold Butte, Nevada, district, where several Salt Lake companies are interested. While the best developed property there at the present time is the Gold Butte, several others are showing up well under development. The Gold Butte company is running an adit which is now in 375 ft. and has already exposed considerable ore of mill value. The Gold Butte district is located about 50 miles southeast of Moapa, Nev., and probably within 15 miles from the proposed route of the branch line of the San Pedro, Los Angeles & Salt Lake Railroad to run from Moapa south to the Colorado river to connect with the Arizona & Utah Railroad at Chloride, Ariz. It is believed this branch road will be built during the coming year and will furnish a direct line to Arizona points from Salt Lake City.

Articles of incorporation of the Salt Lake & Furnace Creek Mining Company have been filed here to operate in the Furnace Creek district, Inyo county, Cal. Ernest Bamberger is president; A. C. Ellis, Jr., vice-president; Herbert Cohen, secretary and treasurer; these, with Herman Bamberger and Russell J. Schulder, all of Salt Lake, are directors.

The management of the Bingham Consolidated Mining and Smelting Company will shortly add two more lead stacks to the equipment of its Bingham Junction smelter to meet the demands of a constantly growing tonnage. Ore from the Stewart mine in the Coeur d'Alene, Idaho, district, which is controlled by F. Augustus Heinze, is to come to the Bingham plant for treatment.

The management of the Ontario mine and tunnel at Park City is confident that the drain adit which was closed something like 18 months ago by caves will soon be reopened. For several months past the company has been running a drift around the caved section, but more recently has been engaged in driving ahead toward the main adit by means of diamond drills, which tapped the water channel. It is believed the situation is now under control and that several of the big producers of the district will in the near future be able to resume operations on the levels from which the workmen were driven by the flood.

The phosphate deposits located in the extreme northeastern corner of Utah and extending into Wyoming and Idaho are being utilized. Two companies are operating there, the San Francisco Chemical and the Union Phosphate companies, and regular shipments are being made.

Denver Nov. 2

The investigations on the part of the Federal Government into the coal-land frauds and the local conditions connected with the coal trust, are being continued and another attorney of the Interstate Commerce Commission, J. T. Marchand, has arrived here to assist Attorney Elmer E. Thomas. The evidence which is being taken in the shape of affidavits is expected to be submitted to Congress together with that taken by Commissioner Charles A. Prouty, when he was here a short time ago.

The output of the Cripple creek district for the past month, as near as the figures can be ascertained now, was about 43,000 tons valued at $1,570,000. As some very high-grade ore was shipped, the average value per ton is much larger than has been the case for some time.

George D. Kilborn, manager of the Isabella mines, has filed a petition in the United States Circuit Court, asking for the removal of Thomas T. Goodale of Boston as receiver of the Taylor Park Mining Company, the property of which is located in Gunnison county. Among the creditors is the Mine and Smelter Supply Company, and that company also filed a similar petition.

As a consequence of an advance in the price of copper and increased facilities for the handling of low-grade ores, the treatment charges by the American Smelting and Refining Company, which were slightly raised some time ago, have been reduced to the former rate. This applies to the Clear Creek county ores.

The Lake City Mining and Smelting Company is figuring on doing custom work for mines in that vicinity, until it can get a sufficient supply from its own properties, which are being developed.

During the past few months a number of Rock Island officials have been making a tour of inspection over the Colorado & Southern Railroad system and at present Robert Mather, general counsel and also member of the executive committee of the system is doing so, which makes it appear as if the Rock Island system is or might be interested in the other lines.

On October 31 the director of the mint purchased 100,000 oz. silver at 70.71c. for delivery at the Denver mint.

Indianapolis Nov. 5

Block coal in the second vein of a bituminous coal mine—something which has never been known before in the coalfields of Indiana—has been discovered by the Brazil Block Coal Company north of Brazil. Some time ago this company drilled land northwest of the city in the bituminous field and sunk a shaft to the first vein, which was a good quality of bituminous coal. Recently the company extended the shaft down to the second vein and to its surprise found the coal was good quality Brazil block of usual thickness. Superinendent Mooney says that bituminous and block coals have never been found before in the same mine and the coal men of this field are at a loss to account for the unusual condition.

Block and bituminous coal are widely different. Block coal commands a higher price in the market than the bituminous, and the miner receives a higher price for mining it. The two kinds of coal are in different miners' districts, the block coal mines being in District 8, and the bituminous mines under the supervision of District 11. In this case the top vein would be mined under the rules and prices of District 11, while the mining of the bottom vein would be under the scale and rules of District 8. The discovery of this new vein of coal, it is believed, opens up a new field of block coal and if such is the case it will prove a valuable find.

Beaumont, Texas Nov. 3

In the Gulf coast oilfields credit-balance prices for crude have just made the largest single advance ever posted in this section. Jennings price advanced 7c.; Humble 4c.; Saratoga 5c. and Sour Lake 3c. The large excess of consumption over the present output and the failure of any wild-cat wells to make good brought about the new prices, which are likely to advance again in a few weeks. The coast refineries can and will use mid-continent crude, for it is much superior for their purposes, but it is not as safe for fuel users. The capital stock of the Texas Company has been increased from $6,000,000 to $12,000,000 and the head offices are to be removed from Beaumont to Houston. The increased capital is to be used in the construction of a pipe-line from the Indian Territory to

Humble in Harris county, which is now the terminus of four pipe-lines running to Port Arthur or Beaumont. The details of construction and the route of the proposed line have not been made public, but it will probably be an 8-in. line between 450 and 500 miles long. It is stated that the owners will handle any oil offered at the posted charges, and that the territory producers will give a large bonus and guarantee a steady supply of crude. The total cost of constructing the main line with branch feeders, tankage and pump-stations is estimated at over $4,000,000, the amount depending on the number of stations required and the quality of the equipment. On a rush order the line could be completed in nine or ten months, and unless the high prices reduce consumption, the stored crude in the coastal fields will be practically exhausted in that period of time. The estimated stocks on Oct. 1 were 12,700,000 bbl. The September shortage was over 1,000,000 bbl. and production is steadily declining, so that the monthly shortage will probably increase. If tank cars were available to transport 15,000 to 20,000 bbl. daily from mid-continent wells to refineries on the coast it could be used at present prices. The refineries, however, own over two-thirds of the stored oil, which they purchased away below present prices, and its none-too-good qualities for refining are not improved by a long stay in tanks, so that it is good policy to use that crude or sell it for fuel. The light grades of mid-continent crude contain more than double the quantity of gasolene and kerosene and with coastal crude at 70c. it is cheaper to buy the mid-continent crude at 40c. and pay $1.25 per bbl. for railway and other charges, provided a steady daily supply is assured. The Gulf Refining Company is already arranging for shipments of territory crude in tank cars, but with present railway equipment it is impossible to supply fully all the refineries by tank car, nor have they the necessary facilities for handling such heavy rail shipments. The proposed pipe-line would have a daily capacity in excess of 15,000 bbl., nearly supplying refinery requirements and thus leave the coast crude for fuel users. The increased price will also reduce, if it does not entirely cut off, water shipments of crude to Atlantic coast refineries. If such conditions are brought about, fuel users will have available 25,000 bbl. daily more than the market now affords, and prices will be more stable.

Nothing could better illustrate the changed conditions in the coastal fields than the facts that Jennings crude has advanced from 22c. per bbl to 75c. in less than one year and that stored oil in the coastal fields has decreased about 7,000,000 bbl. in nine months.

Scranton Nov. 5

Thomas W. Lewis, vice-president of the United Mine Workers, has made the public statement that it is a mistake on the part of the union to participate in politics. Lewis is not in harmony with Mitchell on certain phases of the work of the organization.

Miss A. E. Beeks is in the anthracite region ascertaining the condition of the miners and their homes for the Civic Federation. She states that she is agreeably surprised at their condition.

The Lehigh Valley Railroad will build a spur between White Haven and Sandy Run Junction, which will give a more direct run between the middle and lower anthracite basins. This will also save a haulage of 40 miles for the coal trains to Buffalo.

Daniel Gallagher, of Mt. Carmel, Penn., the father of the miners' certificate law, died last week, aged 45 years.

Contractor C. R. Kinsley, of Scranton, has completed a remarkable task this week, in extinguishing the fire in the old workings of the Finn colliery. In Carbondale, more than 40 years ago there was a subsidence in this colliery when 14 men were entombed, a number never being rescued. Two years ago a fire broke out in the abandoned workings, the origin of which could not be explained. It was impossible to extinguish the flames through the old workings, and large fissures appeared on the surface over more than five acres in area, from which smoke and gases were omitted, together with a volume of steam in wet weather. Public meetings were held to deal with this menace to the community and finally a contract was awarded to Mr. Kinsley to strip the surface to reach the seat of the fire. The excavation was 600 ft. long, 35 ft. deep, from 75 to 100 ft. across the top, and 10 to 15 ft. wide at the bottom. This passed through 20 ft. of clay and shale rock, very loose on account of the caving of the old workings, and two veins of coal, 6 and 8 ft. respectively, over bottom rock. The material in the center of the excavation was removed by means of derricks and scale boxes, from the upper end by carts, and the lower end by cars. The hot excavated material was placed on the surface of the burning side, while the cold material was thrown on the farther side. There were a number of difficulties experienced, principally due to the gas and intense heat from the burning coal, and the settling of the ground underneath the derricks. Water was of no avail, because of the old workings and lower vein, as well as the danger of undermining adjacent properties. Trouble was also experienced from the rapid crossing of fire in the old chambers and crosscuts. The carts and scale-boxes had to be specially made and lined with sheet iron, as red-hot material was removed. The men worked in relays when encountering gas and fire, and a force had to be maintained night and day. About 1500 tons of coal were saved in the excavating, while many thousand tons were cut off from the fire. During the excavations the men came across a loaded car in one of the fallen chambers, which recalled the disaster of 40 years ago. The car was of the old style, the wheels being locked to the axle by keys, while strap rails were used instead of T-iron.

Cobalt, Ont. Nov. 3

The want of accurate statistics of the output of the Cobalt mines is seriously felt. As matters stand, there is little check upon the statements made by brokers and canvassers as regards shipments of ore, which gives an opportunity to unscrupulous speculators to exaggerate the output of their properties. At present the mine owners are obliged to furnish quarterly statements of production to the Ontario Bureau of Mines; but these are not necessarily made public at the time. The feeling is strongly in favor of having weekly official returns as a guide to the actual production, and Hon. Frank Cochrane, the head of the Lands and Mines Department, has been asked to secure the official publication from week to week of the ore shipments made over the Timiskaming & Northern Ontario Railway. He expressed himself in favor of the plan, which will require the coöperation of the railway commission.

During the early days of the Cobalt excitement, speculation in Cobalt town lots ran wild, and as a consequence many people find themselves with real estate on their hands, which will not be required for many years, if ever, for building purposes. As a result of the failure of the town to develop as a business center to the extent anticipated, many of the holders of town lots have begun mining on their property. The Silver City Mining Company organized by residents of Cobalt, who have purchased town lots, are seeking permission of the Government and the railway commission to allow them to mine under the streets adjacent to their property.

Valuable discoveries of graphite have ben made in the region north of Labelle, Quebec, by A. Mandeville and Dr. J. A. Bigonesse, of Labelle. Mr. Mandeville states that the graphite lies on the surface, and can be picked up by hand. He has been assured that American capital can be obtained to develop the property. Finds of uranium and pitchblende have been made in the same region.

London Oct. 27

The report of the Hall Mining and Smelting Company, Ltd., of Nelson, B. C., for the year ended June 30 last, just published in London, where the shares are chiefly held, shows that no profit has been made during the year. The company has not done any mining, but the tributer, Mr. Davys, has been active and the company's share of the profits of his work has amounted to about $4000. The most interesting item of news in connection with developments centered round the discov-

ery of a good vein on the adjoining property belonging to the Dandy Mining Company, and arrangements are now being made to develop the veins on the Hall Company's claims where the same vein comes in. Probably it will be possible to connect with the Dandy tunnel so as to unwater the Hall workings, a method which will be much cheaper than any other way. At the smelter the expenses have just exceeded the receipts from bullion. Purchases of ore accounted for £214,000, and smelting charges, administration and maintenance came to £55,000, while the sales of bullion brought an income of £268,000, being a loss of about £1000. During the year a considerable number of improvements have been introduced, including a new sampling mill and crushing plant, Huntington-Heberlein roasters, etc., and at the present time the smelting department is well equipped for business; so that during the current year the economies should result in a profit to the company. The company points to German competition in buying lead ores in British Columbia as tending to decrease the margin of price between ores and bullion.

The Tomboy Gold Mines Company, of Telluride, Colo., which is under the wing of the Exploration Company, the shares being mostly held over here, has just published its report for the year ended June 30. A total profit of just over £80,000 was made, and out of this £52,500 has been distributed as dividend, or at the rate of 17½ per cent. on the share capital. During the year the Argentine workings have sent 104,063 tons to the mill, from which bullion realizing $947,981 was extracted, at a cost of $514,586. At the present time it is estimated that there are 400,000 tons of reserves of about the same value as the ore milled during the year, and the development work continues to open up ore in a very satisfactory manner.

Last week I referred to the very promising result of Mr. Queneau's tests of the Potter process for concentrating the zinc tailings belonging to the Zinc Corporation. It is now announced that this company is about to embark on its business on an extensive scale and for this purpose a new issue of capital is to be made. The original capital was £350,000, most of which was expended in acquiring tailings heaps, options on future output and experimental plant. It is now proposed to issue 113,333 new £1 shares at £1 5s. each, while subscribers will have the option of acquiring later on 46,667 similar shares at £2 each. The company has already received guarantees of the success of this issue, so it will be in command of £141,666 on the first isue and £93,334 on the second. With this money it is proposed to enlarge the plants at the British Broken Hill proprietary and at the Broken Hill South Blocks, to acquire further options on tailings and also to erect smelting works.

The last mentioned section of the work will not be begun just yet. It is interesting to note also that the corporation is to be converted from an Australian to an English company after the new issue has been fixed up. Some months ago I mentioned that the exactions of the income tax and the fees for registering companies in London were driving companies to other countries, and I instanced the Zinc Corporation as a case in point. It has been found, however, that the advantages so gained are overweighted by other disadvantages. Having the control and the market for the shares in London made it very inconvenient to carry on the financial work and the direction of affairs by means of a Melbourne company.

Johannesburg Sept 29

There is a rumor of a new amalgamation scheme on the East Rand Proprietary mines. The working expenditure on this group is probably the highest on the Rand, and it is thought that by amalgamating interests a reduction of working costs might be attained.

The annual report of the Hercules Mining Company gives some interesting information of present-day shaft sinking on the Witwatersrand. One seven-compartment shaft is being sunk on this property. In June of this year the excellent footage of 164 ft. was made. The average monthly advance for the year is 104.2 ft., at an average cost per foot of $133.11. A steel headgear 105 ft. high is being erected over the shaft.

J. E. Jones, the promoter of several "wild cat" schemes in Madagascar, more especially the Lecomte Syndicate. was examined in the Insolvency Court last week. The Lecomte Syndicate was probably the biggest bubble ever blown in Johannesburg. The shares had a phenomenal rise, due to a report of a reputable engineer, whose samples were cleverly salted.

Diamond mining and promoting is going strong just now, but so far nothing seems to have been definitely proved about the new ventures.

The half castes brought up from Cape Colony—known as "Cape boys"—to work in the mines, have already caused a lot of trouble. Last week 163 of them appeared before the magistrate charged with mutiny. They were cautioned and discharged. These Cape boys were engaged to do unskilled labor in the mines, tramming and shoveling, at so much per truck. They are good workers, but are a very rowdy, drunken set of men. It is freely admitted now that the employment of Cape boys will not settle the labor difficulty. Not only are they more unsatisfactory as unskilled laborers than either Chinese or Kafirs, but they are a standing menace to the skilled artisan. Being British subjects, fully qualified to vote, there is no reason why they should not take on skilled work, when they become proficient, and oust the white man from his sphere. The Cape boy experiment, therefore, is a failure.

General Mining News

CALIFORNIA

CALAVERAS COUNTY

Essex Gold Mining Company—It is expected that this company will shortly reopen the old South Carolina mine near Robinson's Ferry, which has long been idle.

INYO COUNTY

Crackerjack District—Numbers of Nevada and California miners are going to this new camp, joining the Greenwater section on the southeast. A town is to be laid out and a stage line established between Silver Lake station and the new town. The new district is 60 miles northwest of Daggett, and about 20 miles from Silver Lake station, to which point the Tonopah & Tidewater Railroad has been completed. The new section is said to be 30 miles square and rich in gold, silver, copper and lead.

Skidoo Mine—This new property, of which M. Hoeveck, is manager, is about 45 miles from Bullfrog district, and is now being opened by a party of practical miners. Sellers and Carpenter have made a good strike on the property adjoining the Skidoo.

KERN COUNTY

Strike—Bert Brayden has struck what promises to be a valuable mine on Erskine creek, in the Hot Spring county. The ledge is a wide one, and the ore carries gold, silver, and copper. It is a smelting ore. No shipments have yet been made, though development work is progressing.

West Side Oilfield—Drillers have been asked to bid on three oil wells to be sunk in new territory, within three to 12 miles of McKittrick. They are to figure on going down 3000 ft. if necessary. Oil men think there will be considerable development on the west side of the valley during this winter.

SAN BERNARDINO COUNTY

Goldbend Mines and Town Company—This newly incorporated company has acquired from L. M. Myers the Economy, June Bug and Sunrise, 20 miles south of Needles. H. E. Woods of Colorado Springs is president, and Charles E. Woods is secretary.

Long Horn Mining Company—This company, incorporated by John H. Cook, Carl Monk, S. W. Garrett, C. H. Thompson and Richard Garrett of Los Angeles, has purchased from Garrett & Cook their mineral holdings in Horse Thief cañon, Morongo district, for $25,000.

SHASTA COUNTY

Dredging Land—E. E. Martin, of Nimshew, Butte county, has given an option to W. P. Hammon, of Oroville, on 200 acres of mineral land on Cottonwood creek, Shasta county. H. D. White, of Chico, Butte county, has bonded to Marysville

men gravel lands five miles below Redding, Shasta county. Both tracts are to be dredged if the boring tests prove satisfactory.

Quartz Hill Mining Company — The mines of this company near Old Diggings have been leased to the Mammoth Copper Company for five years, with the privilege of extension to ten years. The low-grade silicious ore is worked for flux at the smelter.

SISKIYOU COUNTY

Hydraulic Mines—The miners of Oro Fino, Quartz Valley and other districts are getting their mines, ditches, pipelines, etc., in order so as to be ready to utilize the water from the first rains of the season, which are expected early in November.

TRINITY COUNTY

Deadwood—Webb & Goulet are taking out good ore under the old Lambert works of the Brown Bear. Collins & Clayton are shipping high-grade ore from the Joker. Paulsen & Blagrave are taking good ore out of the Monte Cristo.

TUOLUMNE COUNTY

Crystalline—This mine has been pumped dry and the Table Mountain Gold Mining Company will shortly put a number of men at work on it.

Grizzly—This mine has not shut down as reported. The water has been entirely pumped out of the shaft and drifts.

Keltz—The recent development work has proven satisfactory and the ledge is found to carry good values.

COLORADO

LAKE COUNTY—LEADVILLE

Big Six—In this mine, Breece hill, ore is being taken from the lower levels in the neighborhood of 600 ft. to the amount of 30 tons daily. In character it is a lead sulphide netting $20 per ton. During the week the company declared a dividend of one-half cent per share, amounting to $2500. This is the ninth dividend that the company has declared during the year, the total being $20,000. In the second level a good streak of bismuth has been opened and is being sacked and stored at the mine waiting a market; it will average 13.9 per cent. The other mines in the camp that produce this class of ore are the Ballard and Penn.

Down-Town Section—The Coronado is again employing a full force of men and shipping 350 tons daily of silicious lead ore. The company is doing considerable prospecting in the neighborhood of East Seventh street to locate the Coronado ore-shoot. From the Grey Eagle, which is worked through the Penrose shaft, 150 tons of manganese ore daily are being shipped to the Illinois Steel Works. The Bohn shaft, East Second street, is working both the upper and lower levels and from the former shipping a good grade of argentiferous iron and from the latter a high-grade chloride. The Cloud City people are prospecting with a diamond drill at the lower north drift. The Hibschle shaft, head of East Seventh street, is shipping a small tonnage of good iron.

Enterprise—This shaft, Upper Breece hill, was sunk to a depth of 200 ft., when drifting to the south was started and the drift carried several hundred feet from the shaft when the ore was caught. The body started 4 ft. wide, and is increasing in width as work proceeds. The values to begin with were $20 per ton and as the ore-channel is developed the values increase.

Silver Nugget—This shaft is to the west of the Enterprise and is down 600 ft. The flow of water became so heavy that it was impossible to sink with the machinery on hand. Before going to the expense of installing heavier machinery, the owners will prospect the lower contacts with diamond drills.

East Tennessee—The principal work at present being carried on in this section is at the Jennie June and the Harrington tunnel. The shaft of the former is down 100 ft., and still in the lime and ore at the bottom. The company is of the opinion that when the lime is penetrated the formation will change to blanket and it will be at this zone where the large bodies of mineral will be looked for. At the Harrington tunnel a fair grade of ore has been caught during the week; the tunnel has reached the 100-ft. mark, and is in the lime formation.

Corona—From this mine, California gulch, the lessees are shipping 15 tons daily of good lead ore. The ore is coming from the 180-ft. level and the lessees are drifting toward the end lines. The ore is being shipped to the smelter at Salida.

SUMMIT COUNTY

Banner Placer—This company has had a most successful season and a dividend will be paid on the stock. This is the first year of operation with the full equipment of machinery, and under the management of Col. Lemuel Kingsbury, who launched this enterprise.

New Hope Tunnel—During the season's hydraulic operations on the Banner Placer some rich gold float was encountered and the further work of stripping the ground disclosed fine indications for ledge mining. Col. Kingsbury has secured a lease of some of this ground from the owners of the placer property and intends to run an adit into the hill from the foot of Iowa Gulch to prospect for the lode.

Jessie—The mill is kept going to its full capacity. The work is under the general management of James T. Hogan, who has as superintendent, Charles F. Gilbert. A small test shipment of ore has been sent to Denver to be tried by the Hendryx cyanide method, as it is thought a closer saving can be made by cyaniding the tailings. David H. Lawrance, who is consulting engineer for the Jessie company, is now investigating the matter thoroughly.

Wire Patch—This property is working a large force of men in the mine and mill. The mill runs up to date, have turned out so well that the management intends to increase the milling capacity at once.

Fourth of July—S. F. Stoughton, of Illinois, has secured this property under bond and lease and intends to work it and ship the ore to the Lenawee mill at Montezuma.

Quandary Mountain—The Quandary Mountain Mining Company has resumed operations and is now taking out ore. This is to be milled at the rate of 60 to 75 tons per day.

Gold Dust—This company has crosscut the main vein in the workings below the winze from the lower tunnel. The lode is 12 ft. wide and 4 ft. is of smelting grade of silver lead ore, while the remaining 8 ft. is a good ore for concentration. The hoist and pump are run by electric power, conveyed a distance of 3000 ft. James F. Callbreath, of Denver, is manager.

KENTUCKY

ELLIOTT COUNTY

Kentucky Diamond Mining and Development Company—This company is making arrangements to test the reported discovery of diamonds in Elliott, and has ordered washing machinery.

MICHIGAN

HOUGHTON COUNTY—COPPER

Centennial — Conditions underground show some further improvement, and production is increasing steadily. The drifts northward are richer than those south from the shaft, but lately two drifts south have opened good ground. No. 2 shaft is rapidly being placed in shape for production. Capt. James Chynoweth, Calumet, is in charge.

Old Colony—For a distance of 200 ft. on the 700 ft. level a drift has opened some favorable copper ground. President H. F. Fay, of Boston, visited the mine recently and took samples of the rock home with him. Capt. James Chynoweth, Calumet, is superintendent.

Osceola Consolidated—Contracts have been let for the installation of a 75-h.p. electrical plant at the North Kearsarge branch. At the old Osceola branch preparations are being completed for the installation of an electrical plant, the old boiler-house being remodeled to contain the new compressor and generator. Norman W. Haire, Houghton, is general manager.

Tamarack—Contracts have been let for the installation of a 150-h.p. electrical plant at the mine. The machinery will not be delivered by the manufacturers until spring.

Winona—No. 4 shaft should be in shape

to ship a small amount of rock in 3 or 4 months. Until that time all production will come from No. 3 shaft, to the northward. Dr. L. L. Hubbard, Houghton, is in charge.

KEWEENAW COUNTY—COPPER

Allouez—There has been a remarkable improvement in the character of the openings in the bottom of No. 1 shaft lately. Rich ground has been encountered at several points and the grade of rock going to the mill now is considerably better than that shipped a short time ago. Capt. James Chynoweth, Calumet, is superintendent.

MISSOURI

ST. FRANCOIS COUNTY

Central Mine—After ten weeks' pumping, the famous old Central mine has been unwatered by means of two special Knowles deep-well pumps of 400 gal. capacity each, two baling tanks of 1100 gal. per minute capacity and a Worthington pump of 1000 gal. capacity. The latter was started up under 30 ft. of water and had been submerged ever since the mine was drowned out by the strikers almost three years ago. The new Central mill, of 1200 tons capacity, is being rapidly pushed and promises to be the finest mill in the district. It has a steel frame, and will be operated by electricity from three steam-turbine driven dynamos of 500 kw. each. The crushing department will be in a separate building with the coarse crushing carried on by a pair of 24x42 Blake crushers.

Federal Lead Company—Two new shafts are being sunk on the old Missouri Leadfields property and the Lead Belt Railway is being extended out to them.

Doe Run Lead Company—The new Mitchell shaft is about completed and the railroad is being extended 1½ miles to tap it.

Desloge Lead Company—No. 3 shafthouse was completely destroyed by fire, but without causing any loss of life underground. While this closes down the company's most important mine for several weeks, the mill is kept going by increasing the force on No. 2 and No. 4 shafts. The new No. 5 is also being rushed.

National Lead Company—The new No. 5 shaft at Esther is now completed, and will soon become an important producer.

St. Joe Lead Company—The large stock barn at Bonne Terre was destroyed by fire last week, but the mules were saved.

New Central Shaft—The new shaft on the 40-acre tract in Elvin's has been completed. It is 525 ft. deep and the record-breaking speed of 105 ft. per month was made in sinking it. It is 8x21 ft. in size and has three compartments.

MONTANA

BUTTE DISTRICT

With the exception of the Neversweat, all of the large copper mines of Butte are in operation, but are not yielding a greater tonnage of ore than usual, which fact is attributed to a shortage of the working force. There are not enough miners here to do the work, and the closing of the Neversweat makes no material difference in the output, for all of the men employed in mining have been transferred to other mines of the Anaconda Company. The Neversweat is closed on account of the breaking of the main shaft of the hoisting engine, the result of the ground settling, but will be in operation in a few days. The large operators have been short of miners six months, but have more shovelers and carmen than they can use.

Boston & Montana—This company will increase its production shortly and will ship to the Washoe the quantity of ore mined in excess of that which can be treated in its own plant in Great Falls. The increase will be made by the beginning of operations through the new shaft on the Leonard property. Its West Colusa, which was closed for repairs about September 10, is again in operation, having been started a few days ago. While it was out of commission an average of 1600 tons of ore a day came of the Mountain View in order to make up the deficiency.

Red Metal—This company is shipping between 1200 and 1300 tons of ore a day to the Washoe, which is only a portion of what it expects to be shipping a year hence. This company is developing its mines thoroughly and rapidly. It is sinking and raising a new shaft on the Tramway claim through which it purposes to work the veins of the Tramway and Snohomish jointly with the Butte & Boston and those of the Minnie Healey, which it owns. The shaft is 500 ft. deep and when finished will be 1100, the lowest point yet reached in the Minnie Healey. The raising is from the 1100 of the latter. The new shaft will be equipped with a new hoisting engine, the product of the Nordberg Machinery Company. The company is also opening ore bodies in the Nipper and sinking on the Cora and Rarus.

Butte Copper Exploration—This company, operating the Six O'clock group east of the city, finished its shaft Oct. 30, sinking more than 600 ft., three compartments, since April 1. The shaft is 1018 ft. deep. A station will be cut at the 1000 at once and a large pump placed in it, after which crosscutting north will begin. Manager Geo. T. McGee expects that this work will be under way by Nov. 15.

NEVADA

NYE COUNTY—BULLFROG

Gibraltar—A crosscut from tunnel No. 4 has shown the vein to be over 60 ft. in width. The whole contains milling ore and there is a rich streak on each wall.

Transvaal—Surface trenches have exposed a length of 600 ft. of gold-bearing ore. Two crosscuts from the west drift have also exposed ore of milling grade. Ore has also been cut in an adjoining mine, showing that the vein is auriferous for a considerable length.

Denver Annex—Ore of shipping grade has been cut in the tunnel.

National Bank—The shaft has been sunk to a depth of 300 ft. A station is being cut and drifts will be started at this level to catch the vein. The north drift from the 200-ft. level is in good ore.

Mayflower—The crosscut from the 200-ft. level is still in ore of milling value, the vein being over 60 ft. in width.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments of ore over the Tonopah Railroad for the week ending Oct. 27 were: Tonopah Company, 1600 tons; Tonopah Extension, 365; Belmont, 495; Montana Tonopah, 138; Midway, 54; West End, 57; MacNamara, 30; total from Tonopah, 2739 tons. In addition, 2440 tons were shipped from Goldfield, making a total of 5179 tons.

NEW MEXICO

SOCORRO COUNTY

Tri-Bullion Smelting and Development Company—This company has closed a contract with the Traylor Engineering Company, of New York, for an equipment of hoisting, compressing, pumping and electrical machinery to be installed at the Kelly mines. The hoisting plant will be capable of handling 500 tons of ore a day from a depth of 1000 ft. It will consist of a double-cylinder, double-drum, first-motion hoisting engine, with cylinders 18x36 in., three 150-h.p. boilers, a steel gallows frame, and all the necessary equipment. The boilers will also furnish the steam for the compressor plant, which will be capable of operating 15 Ingersoll-Rand drills, and for an electric lighting plant and pumping plant. Besides these the Traylor Engineering Company is now designing for this company complete reduction works, to consist of a 300-ton zinc oxide plant, a 350-ton concentrating plant and two furnaces. One blast furnace will be for smelting silver-lead ores and the other for copper ores. This plant will be located in the coal districts, at some convenient place along the line of the Atchison, Topeka & Santa Fe Railroad. The reduction works will treat custom ores as well as those from the Kelly mine.

OREGON

BAKER COUNTY

Rainbow—These mines, W. E. King, manager, in the Mormon Basin camp, 50 miles southeast of Baker City, are a group of twelve claims, have a 20-stamp mill in full operation, and are paying dividends on ore which averages $16 to the ton. The owners are contemplating further enlargement of the property. The mine is particularly well situated and the mill, half a mile distant, receives the ore by an

aërial tramway. This carries 30 buckets, with a capacity of 300 lb. each, and makes the round trip in 24 minutes, the tram delivering 11 tons of ore per hour. There are 30 men at work, and next season the force will be enlarged. The ledges are worked by tunnels, about 1500 ft. of tunnels and crosscuts having so far been completed. The main ledge is about 4 ft. wide.

Power Plant—Miners and residents of Powder Valley, north of Baker City and near the United Elkhorn camp, are much interested in the new hydro-electric plant, which will soon be put in operation by Goodwin Young, of Haines. The plant will take power from the Dutch Flat reservoir, and transmit it throughout the valley and to the different mines. The poles have been set for the main line to Haines, and within 10 days, Haines and North Powder, Radium Springs and several mining camps will have light, while power will be furnished in the Pocahontas district.

DOUGLAS COUNTY—BOHEMIA DISTRICT

Oregon Securities—This company has all outside work finished. Outside operations, such as transporting ore from the Musick mine, will not be discontinued as long as the track remains clear of snow. The surface electric road from Musick mine to the orebins above the mill is working well. When the snow falls so as to interfere with transportation, ore from the Champion mine will be sent to the mill, as the Champion tram is covered.

Henry Clay Group—This property, under the management of Frank McIntyre, is making a good showing. Work will be carried on in the tunnels all winter.

Pittsburg—This property, owned by Mr. Shane and Alaska parties, is being developed, and some copper, gold and lead ore blocked out awaiting treatment.

Oregon-Colorado—Manager Hard has a force of men at work on this group of claims, and will continue development work all winter. Copper ore is being blocked out is awaiting treatment.

Bohemia Queen—This property, owned by Portland parties, is under steady development, and Herbert Cline is the superintendent. It is a free-milling property.

Twin Rocks—The property owned by this company in Bohemia is being developed by a cross-cut tunnel at the present time.

PENNSYLVANIA

ANTHRACITE COAL

Broad Mountain Coal Company—Two residents of Dunmore, near Scranton, John Carney and William Greavy, have leased a tract of land near Pottsville, containing 640 acres, with an estimated content of 10,000,000 tons of coal. The tract adjoins the property of the St. Clair Company and is regarded as valuable. A company to be known as the Broad Mountain Coal Company is to be organized to work the tract, with a capital stock of $100,000.

Delaware, Lackawanna & Western—This company's National breaker will resume operations on Nov. 15 after an idleness of five months, for reconstruction of the interior of the breaker.

Lehigh & Wilkes-Barre—This company has commenced a modern piece of work in the new No. 21 Tresckow slope at Hazleton, where it is concreting the opening from the surface to the solid rock. The concrete will take the place of expensive timbering.

Lehigh Valley—The work of clearing the wreckage at the Exeter breaker, of this company, in Pittston, is proceeding rapidly. The mules have been removed from the mine and the miners will be employed in the Maltby and Westmoreland collieries.

Philadelphia & Reading—This company has awarded a contract to O'Brien & Ryan, of Heckscherville, for driving a tunnel at the Wadesville shaft to connect the Skidmore and Buck Mountain veins, near Pottsvlle. The tunnel will be 960 ft. long.

Luzerne County Coal Company—A number of residents of Berwick and Shickshimmy have combined to organize a company under the title of the Luzerne County Coal Company to develop the newly discovered Shickshinny anthracite field. Hitherto Berwick and Shickshinny have been regarded as being totally outside the anthracite region, but ever since a continuation of the Red Ash vein was discovered on the Stackhouse farm, the coal excitement in and around Shickshinny has been intense. Two thousand acres of coal land have been leased and drills are being used to prospect for coal. It is also claimed that the town of Berwick is situated over coalfields.

BITUMINOUS COAL

Youngstown Iron Company—Jacob Stambaugh, representing this company, has bought 3000 acres of coal land in Mahoning and Pulaski townships in Lawrence county. The company will soon begin to open mines for the supply of its own works.

SOUTH DAKOTA

LAWRENCE COUNTY

Esmeralda—Operations have been resumed on this property after having been suspended for a month. The cyanide annex of the mill has been undergoing repairs and is now in good condition. It will be run at its full capacity of about 30 tons every 24 hours.

Hidden Fortune—Another extension of 60 days has been granted this company in connection with the sheriff's sale. This extension is for the purpose of giving the company time in which to effect, if possible, the proposed consolidation with the Columbus.

Homestake—A force of 20 men is engaged in grading for an annex to be built to Cyanide No. 1. This addition will be 60 ft. in length and 30 ft. wide, and will be used as a precpitating press room. This addition will make the plant almost 400 ft. in length.

PENNINGTON COUNTY

Dakota-Calumet—At the stockholders' meeting in Sheridan last week it was decided to make as rapid progress as possible on this property. The main shaft has reached a depth of 325 ft. and is still going down. A second shaft, going down on the south end of the property, is 70 ft. deep and is passing through iron sulphide.

Maloney Blue Lead—At the annual meeting, just held, the following officers were elected for the ensuing year: President, John Harnan; vice-president, Philip Harnan; secretary and treasurer, J. G. Thomas.

TENNESSEE

POLK COUNTY

A Washington despatch says that on Nov. 5 the United States Supreme Court overruled, without prejudice, the demurrer filed by the Tennessee Copper Company and the Ducktown Sulphur, Copper and Iron Company to the suit of the State of Georgia to prevent the operation of the smelters belonging to the two companies situated in Tennessee. It was contended that the trees and other vegetation of the Georgia side of the line were destroyed by the fumes generated. The court dered the case to be heard on Feb. 25, next.

UTAH

BEAVER COUNTY

Utah & Michigan—This company has let a contract to drive an adit 200 ft. on its property.

Copper Mountain—This property has fallen into the hands of Samuel Newhouse through purchase, and is being developed.

Newhouse Mines and Smelters—This corporation is preparing to increase its output and a contract has been let to erect about 40 cottages for the accommodation of additional men. It is also the intention to increase the capacity of the present mill and to ship crude ore.

JUAB COUNTY

Utah Mine—A car of ore from this property, which is located in the Fish Springs district, sold this week for $5974, net. The lot consisted of 57 tons.

Scranton—This company, which is the largest shipper of zinc ore in the State, has gone to considerable expense in making surface improvements and is now ready for the winter campaign. It is possible that an aërial tramway system will be built next year. Newton Dunyon, Herald building, Salt Lake, is manager.

WEBER COUNTY

Napoleon Maghera—This company,

operating in the Sierra Nevada mining district near Ogden, is working 15 men under the management of Don Maguire, of Ogden. An adit has been driven for a long distance and has exposed considerable ore.

VIRGINIA

CAMPBELL COUNTY

Piedmont Manganese Company—This company has been organized to open manganese deposits. The office is at Lynchburg. D. W. Meyers is president; D. L. Ragland, secretary and treasurer.

JOHNSON COUNTY

Virginia Coal and Iron Company—The iron-ore deposits on Stony creek, owned by this company, are to be worked by R. E. Landreth, under lease.

PRINCE EDWARD COUNTY

Dominion State Mines Corporation—This company proposes to mine what is said to be a large deposit of feldspar. C. G. Stafford, Philadelphia, Penn., is president; George G. Matchett, Farmville, Va., secretary.

WASHINGTON

FERRY COUNTY

The discovery of a vein of ore 5 miles west of Keller, on Dick creek, is reported. It is said to be 24 ft. wide and cropping 180 ft. in length. The ore is described as looking like brown hematite in a gangue of purple quartz. It assays in gold, silver and copper.

Gwinn Mine—A new body of ore has been struck that carries lead and silver with some gold. The shoot is 14 ft. wide. Two groups of claims which carry the north and south extensions of the Gwinn lode have been sold to Tacoma, Wash., people for $35,000.

Iconoclast—A tunnel has been driven 175 ft. on ore which shows native copper. The vein averages 3 ft. in width.

Silver Creek—Two shifts are employed driving the lower tunnel, to connect with the bottom of a winze, at a depth of 304 ft. In the winze is 2½ ft. of shipping ore in a 7-ft. vein.

OKANOGAN COUNTY

Q. S. Mining and Smelting Company—The following trustees have been elected for the ensuing year: A. M. Dewey, M. L. Bevis, Emil Simon, L. K. Armstrong and E. J. Hyde, Spokane, Wash.; C. Drake, Milwaukee, Wis.; E. H. Thatcher, Republic, Wash.; Emmett Harris, San Francisco and H. W. Gifford, Camp Guess, Wash. A. M. Dewey was elected president; M. L. Bevis, vice-president, C. L. Shuff, secretary; E. J. Hyde, treasurer; L. K. Armstrong consulting engineer. The president's report showed that during the past year $6000 debts had been paid and $16,000 had been spent on development. The power plant on Sinlahekin creek is nearly finished. A part of the plans for the coming year is to drive a tunnel 1500 ft., to cut the main vein 1000 ft. below present tunnel level.

WISCONSIN.

ZINC DISTRICT

Conservative—A contract was let last Monday to a Galena firm for the installation of an electric power and drilling plant, to be ready in 45 days. A 40-kw. Northern generator, four box-type drills will be included, and wire line, distributing to three different shafts about a half mile distant from power house.

Liverpool—Mineral Point will have two new mines producing soon. Both mills are experiments to a certain degree, being a departure from well known Joplin method in that the jigs are to be of the Hancock type.

Glanville—The second-hand mill machinery arrived from Joplin last week. The Glanville has been paying dividends with a primitive outfit. The mill will be located near a good stream, assuring plenty of water.

Foreign Mining News

CANADA

NEW BRUNSWICK

In examining the iron-ore deposits near Bathurst, N. B., Einar Lindeman, of the Canadian Geological Survey, discovered from the magnetic intensity lines of one of the orebodies another deposit previously unknown and much larger in extent. The new deposit is 75 ft. in hight by 80 to 100 ft. wide and extends for 1800 ft. down to the Nipissiquit river, appearing to cross it. The discovery exemplified the method of examining magnetic iron ore introduced from Sweden by Dr. Eugene Haanel.

NOVA SCOTIA

Dominion Coal Company—President James Ross states that the season's operations have been attended with some difficulties, owing to the scarcity of labor, which is now being gradually overcome. The company has found it impossible to meet all the demands of customers. The Dominion Iron and Steel Company has taken about 200,000 tons in excess of last year's requirements. The output this year totals less than 4,000,000 tons. Outside of sales to the Dominion Steel Company, and the Everett Coke Works, the company had not increased its sales to general customers since 1902. During the last year nearly $1,000,000 had been expended on new works and improvements. President Ross, General Manager Duggan and other officials of the company recently inspected the mines of the Cape Breton Coal, Iron and Railway Company, at Broughton, N. S. It is believed that negotiations are on foot for their purchase by the Dominion Coal Company.

ONTARIO—COBALT DISTRICT

Watt—This property, Cobalt, adjoining the McKinley-Darragh-Savage and other leading mines, has been bought by a syndicate of Canadian and American capitalists. It is a shipping mine, one carload of ore which carried high values having been marketed and another being ready for shipment. Active operations with modern mining machinery and equipments will be undertaken at once.

Nipissing Mines—The Bonanza vein, or Ledge 49, regarded as the richest vein on the property, is being opened up. This vein has a width of about 60 in. for about 150 ft., the contents of the ore being largely cobalt. It then narrows down considerably for 10 ft. or more, this section varying in width from 14 to 28 in., but being much richer in silver content than the wider part of the vein. In some places the vein carries so much pure silver that it will have to be chiseled out in working. Of the 50 veins thus far discovered on the Nipissing properties, fully one-half have been developed to depths ranging from 25 to 65 ft., and, with but one exception, have continued to show sustained values at the lower levels. The company is making preparations to operate on a more extended scale. A large central compressor will be shortly installed to supply power. A central shaft will be sunk to a depth of 500 ft. on Ledge 49. At Ledge 26, which has proved productive, a shaft is being put down, and at the 70-ft. level, drifts will be run to the three veins which converge near this point. The use of the hydraulic plant in stripping and discovering new veins has been satisfactory, about half a dozen veins having been found by this process. Shipments from the Nipissing during the current year have approximated about $100,000 per month.

La Rose—One of the veins disappeared at the 300-ft. level, but a few days since was recovered by crosscutting, and is still being followed downward.

Foster-Cobalt—This mine, at Cobalt, has hitherto been worked by hand only, but under the new management new methods will be at once adopted. A. W. Scott, of Pioche, Nevada, has been appointed manager. A compressor plant and steam hoists will be installed as soon as possible. F. C. Loring, the mining engineer in charge, states that ore to the approximate value of $700,000 is already blocked out. A force of about 40 men are at work.

Right of Way Mining Company—This company, which has leased from the Ontario Government, the privilege of mining along the right-of-way of the Timiskaming & Northern Ontario Railway, has begun operations. T. A. Beament has been elected president; E. Seybold, vice-president; E. A. Larmouth, secretary-treasurer. The head office is in Ottawa, where nearly all of the stock is held.

YUKON TERRITORY

D. D. Cairnes reports from southern Yukon to the Canadian Geological Survey respectng the development of the copper-mining industry west of White Horse. The latest discovery has been made by Byron X. White of Spokane, who has uncovered on the Pueblo an orebody 250x270 ft., neither wall of which has been found, though he has sunk 100 ft. The ore is hematite, heavily impregnated with copper minerals and yielding some gold. It is all practically shipping ore and will average about 4 per cent. copper, but there are masses and streaks interspersed of higher grade. With rough hand-sorting high-grade shipments can be made. Mr. White is shipping 100 tons and buyers are negotiating for future shipments. Other deposits of this camp are those of the Copper King, Copper Queen, Arctic Chief and Carlisle.

EUROPE

SPAIN

Rio Tinto Company, Ltd.—The directors have issued the following interim report, dated London, Oct. 10: "The deliveries of pyrites in the United Kingdom have so far this year been rather below those of last year; the Continental and United States consumption is, however, higher than that of 1905. The copper content of pyrites shipped to all markets has been somewhat lower. The consumption of non-cupreous sulphur ore is very largely in excess of the previous year. The quantity of refined copper produced will probably somewhat exceed 1905. The ore mined during the first half of the year was of about the same quality as that obtained from the mine in 1905, and this year's output of copper at the mines will probably be larger than that for 1905. The position of the copper market has been exceedingly satisfactory during the whole of this year, and even better prices have been obtained than in 1905, and all indications point to a continuance of high prices. The consumption over all the world increases at an even more rapid rate than the output of copper.

"Your directors have now the pleasure to declare, out of the estimated profits of the year, a dividend for the six months ended June 30 last of 2s. 6d., less income tax, on the 5 per cent. preference shares, and an interim dividend of 50s. per share, free of income tax, on the ordinary shares, both payable on Nov. 1 next."

NEW CALEDONIA

Exports of minerals in August and the eight months ending Aug. 31, are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

	Aug.	Eight Mos.
Nickel ore	5,538	77,137
Cobalt ore	153	1,517
Chrome ore	....	37,257

No chrome ore has been exported for the last two months.

Coal Trade Review

NEW YORK, Nov. 7

The coal trade in the West is still mainly a question of railroad transportation. No improvement in car distribution or movement of coal is reported, and complaints are widespread. The consequence is irregular operation of mines in many districts.

In the East the trade continues quiet, mainly on account of the continued mild weather. There is some complaint of car shortage, but much less than in the West. Coastwise trade is rather dull for the season.

COAL TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Oct. 27 were as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	3,744,726	3,636,025	D. 108,701
Bituminous	24,334,596	26,226,579	I. 1,891,983
Coke	9,100,705	10,380,045	I. 1,279,340
Total	37,180,027	40,242,649	I. 3,062,622

Coal shipments originating on the Southern Railway for the eight months ending Aug. 31 were, in short tons: Tennessee district, 1,061,264; Alabama district, 1,208,599; total, 2,269,563 tons.

The coal tonnage of the Baltimore & Ohio Railroad for the eight months ending Aug. 31 is reported as follows:

	1905.	1906.	Changes.
Anthracite	664 354	572,481	D. 91,873
Bituminous	14,526,325	16,587,815	I. 2,061,490
Coke	2,998,746	3,850 367	I. 851,621
Total	18,189,425	21,010,663	I. 2,821,238

This shows for this year an increase of 15.5 per cent. in the total.

Coal and coke shipments over the Norfolk & Western Railway for the eight months ending Aug. 31 were, in short tons:

	Coal.	Coke.	Total.
Line points	5,420,451	1,395,367	6,815,818
Tidewater	2,209,658	115,320	2,324,978
Total	7,630,109	1,510,687	9,140,796
Total, 1905	6,769,208	1,620,857	8,390,065

The total increase was 750,731 tons, or 8.9 per cent. Of the shipments this year 74.6 per cent. were delivered to line points and 25.4 per cent. to tidewater.

Coal tonnage originating on the lines in the Ohio Coal Traffic Association is reported as below for the eight months ending Aug. 31, in short tons:

	1905.	1906.
Hocking Valley	2,205,948	2,497,612
Toledo & Ohio Central	951,925	1,093,878
Baltimore & Ohio	1,313,138	1,127,305
Wheeling & Lake Erie	1,675,841	1,329,847
Cleveland, Lorain & Wheeling	1,327,022	1,284,078
Zanesville & Western	553,092	717,706
Toledo Division, Penna. Co.	1,161,333	1,461,887
Lake Erie, Alliance & Wh'ling.	473,364	403,547
Marietta, Col. & Cleve	.....	5,785
Total, net tons	9,661,663	9,921,645

The total shipments show an increase of 259,982 tons, or 2.7 per cent., this year, notwithstanding the two months' suspension of mining on account of the strike.

Shipments and receipts of coal at all Lake ports, for the year to Aug. 31, are given by the Bureau of Statistics as below, in net tons:

	1905.	1906.	Changes.
Shipments	8,909.617	10.074,236	I. 1,164 619
Receipts	7,745,219	8,895,811	I. 1,150,592

The excess of shipments over receipts is accounted for by coal shipped to Canadian ports; and by coal taken by steamships for their use.

Receipts of coal and coke at Chicago, with shipments from that city to tributary markets, are reported by the Chicago Bureau of Coal Statistics as below, for the eight months ending Aug. 31:

	Received.	Shipped.	Balance.
Anthracite	839,288	368,315	470,973
Bituminous	6,676,687	1,743,155	4,933,532
Coke	247,080	178,860	68,220
Total	7,763,055	2,290,330	5,472,725
Total, 1905	6,845 905	1,884,055	4,961,850

The balance represents approximate consumption in Chicago. The bituminous receipts this year were made up as follows: Pennsylvania, 568,589 tons; Ohio, 562,074; West Virginia; Indiana, 1,845,746; Illinois, 3,089,334 tons.

New York Nov. 7

ANTHRACITE

The situation in the anthracite market is considerably stronger than during the past few weeks. The demand is good, but operators are handicapped by the shortage in car supply. It is expected that when the Lake traffic closes for the season and when agricultural products have been largely moved, that this shortage will be overcome and probably in the early part of December there will be a sufficient supply to move all the coal necessary. The shortage seems to affect the coal being moved to the West rather than that for local consumption. Prices remain at $4.75 for broken and $5 for egg, stove and chestnut; for steam sizes, $2.80@3 for pea; $2.25@2.50 for buckwheat; $1.45 @1.50 for rice; $1.30@1.35 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade shows a better tone and some advances in price on the lower grades. There have been large quantities of coal arriving at tidewater points which could not be moved on account of weather conditions, and now that these have improved, the accumulations at all tidewater shipping ports are being absorbed by the markets without showing any bad effects. Indeed the price of the poorer qualities has advanced 10c. per ton.

Car supply is still a bad feature in the trade and no signs of improvement in the near future are apparent.

Trade in the far East is a little stronger and there is considerable urgency on ice-making port orders. Trade along the Sound is much improved, the demand being considerable; this seems to be over

and above the demand caused by water transportation difficulties.

New York harbor trade is fairly strong with best grades of coal selling at about $2.70 f.o.b. New York harbor shipping points, while poorer grades are bringing $2.40. All-rail trade is showing an increased demand, with prices tending upward. It is understood that cars are being refused for all-rail New England business. Transportation from mines to tide is fairly good, but here also the car supply is poor, some mines reporting that they are not getting 20 per cent. of their requirements.

In the coastwise vessel market vessels are extremely scarce owing to adverse winds holding all classes of vessels in harbor.

We quote current rates of freight from Philadelphia as follows: To Boston, Salem and Portland, 80c.; to Providence, New Bedford and the Sound, 70c.; to Portsmouth, 85 cents.

Birmingham Nov. 5

Much complaint is heard in Alabama coalfields in regard to the railroad-car shortage. On top of this there is a shortage of locomotive power. Reports come to the Birmingham district that there is a scarcity of fuel in New Orleans, and Alabama coal is wanted. The producers in this State assert that the domestic business is sufficient to command all the coal that can be mined. The railroad-car shortage, therefore, is felt. There is no end to the development going on throughout the State, especially in the western part of Jefferson and in Walker county.

The coke demand is still strong and the production improving a little. There is not likely to be any over-production in this line in many months to come. The strong iron production is responsible for the heavy consumption.

Chicago Nov. 5

The local wholesale coal market improves each week, though the progress is slow. Except for fine coals, the market as regards products of Western mines is in a satisfactory condition. Cars are difficult to get, and this is a detriment to business outside the city; but for city trade the scarcity keeps down the surplus of shipments from Western mines. Eastern coals are still held back by car shortage and prices, in consequence, are very firm. Anthracite is active, consumers and retail dealers seeming at last to have awakened to a need of laying in stores for the winter.

Illinois and Indiana lump and egg bring $2@2.80; run-of mine $1.75@2.25, and screenings $1@1.60. The market for fine coals is improving slowly; prepared sizes are in rapidly increasing demand.

Hocking coal is in great demand, compared with the supply, and there is no shading of the standard quotations—$3.30 for run-of-mine and $3.65 for lump. Smokeless is scanty and the demand is active. Run-of-mine brings $3.30@3.40, and lump and egg $4.30. Youghiogheny is scarce, and brings $3.50 per ton.

Cleveland Nov. 6

The coal trade is still governed largely by the car shortage, which is growing more acute, rather than showing any let up. This has had the most influence on steam coal for strictly local use. Prices have risen, indicating the difficulties of the mines in making deliveries, and at present mine-run is selling on the basis of $1.50 a ton at mines for Ohio, with Pennsylvania selling at about $1.25 at mines. This has had a similar effect upon the price of slack, which is selling at 90c.@$1 at mines for Pennsylvania, while Ohio slack is selling at about $1.25 at mines, freight rates making the difference.

The lake situation is still hampered by the car shortage. The situation has been intensified, if anything, by the developments of the week and shippers have reached the philosophical conclusion it will be necessary for them to be content with a partial fulfillment of contracts for this season. It has been impossible, practically, to do more than take care of contract boats and this only in a halting fashion.

The intention is to increase the price of domestic coal in the near future by 25c. a ton. This announcement is made by the Massillon association, governing the output in that territory. This would bring the price of selected lump to $2.35 at mines. The dealers here are still doing business in a hand-to-mouth fashion, depending on a precarious car supply.

The coke market is still strong. Many of the furnaces and foundries, in order to avoid suspension of operations a little later in the year, are trying to collect a surplus. This extraordinary demand, coming upon a good strong current demand, is stiffening the market. The prices are now $4 at the oven for the best grades of 72-hour foundry and $3.25@3.50 at the oven for furnace coke.

Pittsburg Nov. 6

Coal—The shortage of railroad cars continues and the restriction of production is causing some apprehension. It was reported early this week that a serious famine in coal is threatened. W. R. Woodford, of the Pittsburg Coal Company, John H. Jones of the Pittsburg-Buffalo Company, and other large operators declare there is no danger of a famine. It is expected that there will be enough cars to meet all requirements when the lake shipping season closes. Prices are firmer this week and the minimum for run-of-mine coal is $1.45 a ton at the mine, but some sales have been made at 10 and 15c. above that figure. The supply of coal in Southern ports is being exhausted, but it is believed there is a sufficient supply to last until the next rise in the rivers. There is loaded and ready for shipment over 25,000,000 bu. Rivermen seem confident of a good boating stage of water before December.

Connellsville Coke—Conditions remain practically the same as a week ago and prices are unchanged. Furnace coke for this year is quoted at $3@3.25 and foundry at $3.75@4 a ton. There was a slight decline in production, according to the *Courier*, but shipments were greater. The production for the week is given at 280,826 tons and the shipments aggregated 15,512 cars distributed as follows: To Pittsburg, 5259 cars; to points west of Pittsburg, 8705 cars; to points east of Connellsville, 1548.

Foreign Coal Trade

Nov. 7

Exports of coal and coke from the United States for the nine months ending Sept. 30 are reported by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1905.	1906.	Changes.
Anthracite	1,736,779	1,670,256	D. 66,523
Bituminous	5,286,192	5,620,074	I. 333,882
Total coal	7,022,971	7,290,330	I. 267,359
Coke	455,687	577,207	I. 121,520
Total	7,478,658	7,867,537	I. 388,879

In addition to the exports above there were 3,410,198 tons of coal loaded on foreign steamships this year for use as fuel, which brings the total up to 11,277,735 tons sent out from the United States. The coke went chiefly to Mexico; some was also exported to Canada, chiefly to Ontario. The distribution of the coal was as follows:

	1905.	1906.	Changes.
Canada	5,379,334	5,475,780	I. 96 446
Mexico	661,398	857,215	I. 195,817
Cuba	384,106	487,796	I. 103,690
Other W. Indies	221,485	237,076	I. 15,591
France	3,252	2,758	D. 494
Italy	67,427	46,958	D. 20,469
Other Europe	21,756	22,903	I. 1,147
Other countries	284,213	159,844	D. 124,369
Total	7,022,971	7,290,330	D. 267,359

The coal reported under other countries went chiefly to South America. Canada took this year 75.1 per cent. of the total shipments of coal. The exports to Canada in detail were:

	1905.	1906.	Changes.
Anthracite	1,713,037	1,643,570	D. 69,467
Bituminous	3,666,297	3,832,210	I. 165,913
Total	5,379,334	5,475,780	I. 96,446

The total increase this year was 1.3 per cent.

Imports of coal and coke into the United States for the nine months ending Sept. 30 were as follows:

	1905.	1906.	Changes.
Canada	967,511	1,109,065	I. 141,554
Great Britain	49,340	85,508	I. 36 168
Japan	41,636	11,726	D. 29,910
Australia	121,639	141,920	I. 20,281
Other countries	397	4,225	I. 3,828
Total coal	1,180,523	1,352,444	I. 171,921
Coke	42,936	102,141	I. 59,205
Total	1,223,459	1,454,585	I. 231,126

Of the coal imported this year 17,448 tons were classed as anthracite. With the exception of some Nova Scotia coal which comes to New England ports, most of the coal is received on the Pacific coast. Coke was not reported separately prior to July 1, 1905. A few thousand tons of coke come from Germany; the rest is from British Columbia.

Iron Trade Review

NEW YORK, Nov. 7

The general condition of the iron and steel trade remains the same as last week. There is no falling off in the volume of new business, especially in structural work. Prices of finished material nominally show little change, but there is a good deal of trouble about deliveries. Many projects for new work will be delayed on account of the slow delivery of material.

Pig-iron prices continue to go up, both for short and later deliveries, under the pressure from consumers. Some iron is being imported, but not enough to affect the general situation.

The ore situation is not changed. From present indications the season of navigation will hold out well, and iron ore is being rushed down rapidly. The supply will probably be sufficient, but iron ore and coke prices will be higher next year.

Iron and Steel Exports—Exports of iron and steel, and of machinery, from the United States for the nine months ending Sept. 30 are valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1905.	1906.	Changes.
September.....	$12,153,798	$13,891,472	I. $1,737,674
Nine months. ..	102,922,277	127,189,673	I. 24,267 396

The increase was 14.3 per cent. for September and 23.6 per cent. for the nine months. The leading items of iron and steel exports for the nine months were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	36,206	60 415	I. 24,209
Billets, ingots & blooms	152,076	170,462	I. 18,386
Bars.....	41,520	64,410	I. 22.890
Rails.....	219,248	250,278	I. 31,030
Sheets and plates. .	51,420	78.989	I. 27.569
Structural steel....	56,200	83,891	I. 27,691
Wire	98,630	126,293	I. 27,663
Nails and spikes.	37,990	47,492	I. 9,502

The larger exports of rails this year were to South America, 92,565 tons; Canada, 64,873; West Indies, 28,652; Mexico, 17,840 tons.

Iron and Steel Imports—Imports of iron and steel, including machinery, into the United States for the nine months ending Sept. 30 are valued by the Bureau of Statistics as below:

	1905.	1906.	Changes.
September	$2,154,127	$2,832,199	I. $678.072
Nine months.....	19 565,755	24,376,887	I. 4,811,132

The increase for September was 31.5 per cent.; for the nine months it was 24.6 per cent. The more important items of the imports for the nine months were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	152,651	229,876	I. 77,225
Scrap.....	8.680	10,511	I. 1,831
Ingots, blooms, etc.....	10,505	14,977	I. 4,472
Bars.....	26,194	25,607	D. 587
Wire-rods.....	12,732	13 444	I. 712
Tin-plates.....	54,982	37,756	D. 17,226

The most noticeable points are the increase in pig iron and the decrease in tin-plates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the nine months ending Sept. 30 are reported as below, in long tons:

	1905.	1906.	Changes.
Exports.....	160,378	234,310	I. 73 932
Imports.....	650 286	818,630	I. 168,344

Most of the exports were to Canada, while the imports are chiefly from Cuba.

Imports of manganese ore for the nine months were 211,564 tons in 1905, and 155.-409 tons in 1906; a decrease of 56,155 tons this year.

Birmingham Nov. 5

Pig-iron quotations in the Birmingham district are advancing. Spot iron is quoted at more than $22 per ton, No. 2 soft, while iron for delivery during the first quarter of the year is approaching $20 per ton, No. 2 foundry, and $18.50@19.50 per ton for delivery during the second quarter of the year. There is some complaint as to the raw-material supply again, the furnace bins being far from overstocked. There is steady work at the various mines and quarries, and the weather has been favorable recently for outside work, but the consumption is growing rapidly. The production is holding its own right along. Only two of the furnaces of the Republic company at Thomas are in blast. There are less than three furnaces in this district nearing shape to be started up; in fact, there are not many furnaces out of commission in this State. The demand for the product holds up splendidly, the probable make the coming first half of the year having already been provided for.

The steel situation is strong. The mills are doing nicely, the output in October coming up to all expectations. The inquiry for steel and steel products continues strong. There is but little business being accepted, as the orders on hand will require a large portion of the probable make for some time to come.

The demand for cast-iron pipe is good, and shipments are large. Good prices obtain. Rolling mills in this section are doing nicely. Foundries and machine shops are busy, with bright prospects.

The property of the Lookout Mountain Iron Company was sold in Birmingham this week at receivers' sale. Charles Stephens, representing the First National Bank of Cincinnati, bought all of the property except the commissary supplies, the bills receivable and the balance of current accounts. The price paid was $304,875. J. B. Robinson, of Chattanooga, Tenn., bought the commissary supplies for $4550. The bids made will have to be approved by the Federal court before the sale is completed.

Chicago Nov. 5

The feature of the iron market is the increasing demand for both quick-delivery iron and that due on contracts running into the second, third and fourth quarters of 1907. Quick-delivery orders yet dominate the market, but the dealings in regular contract deliveries have been heavy in the last week, indicating confidence of melters in the stability of the future. Prices are speculative, and cover a wide range. The scarcity of iron from both Northern and Southern furnaces, the car-shortage troubles and the local exigencies of buyers are all causes of the speculative conditions. In general, however, prices are advancing, the average of such sales as are known showing 50c. or $1 advance in the last two or three weeks on contract orders. On quick-delivery lots the variation is great; such lots—500 to 1000 tons mostly—being in such eager demand that $1@2 premium is frequently paid over contract prices for 1907.

On contracts for next year's deliveries, Northern No. 2 brings $22.50@23, and Southern No. 2 $18@18.50 Birmingham ($21.90@22.40 Chicago). Lake Superior charcoal, scarce and selling in small lots, brings $23.

Cleveland Nov. 5

Iron Ore—The first general buying of iron ore for 1907 delivery has been done, starting on Monday. This is likely not to be as heavy this year as formerly, on account of the increased grasp of the steel-making companies on the ore deposits. The Ore Association had no influence on values, but about all shippers named the same prices. Bessemer ores increased about 75c. a gross ton and non-bessemer about 50c. This increases the differential between the two grades, emphasizing the growing shortage of the higher-grade ores. At the same time it is practically impossible to make any definite statement of prices, due to the general lowering of the level of quality of Lake ores. This is the result of the stripping of mines of the higher-grade ores in all departments. It is comparatively conservative to say the base prices for accepted analyses are as follows: Bessemer Old Range, $5 f.o.b. Lake Erie ports; bessemer Mesabi, $4.75; non-bessemer Old Range, $4.20; non-bessemer Mesabi, $3.95 per ton.

Pig Iron—Buying of foundry pig is difficult, due to the acute shortage. Only small lots are coming out at present, mostly from speculators and from widely separated furnaces. The price in places has touched $25 for No. 2 for spot shipment, although general buying is on the basis of $24 at furnace. About the same prices prevail for first-quarter delivery. Southern producers ask $20, Birmingham, for No. 2 and $18 for first-half delivery. Basic is scarce and is selling in small lots at $24 to $25 a ton. Bessemer is about on the same basis.

Finished Material—There is a good, stiff demand for billets and it has about reached the stage where producers must decide whether they want to continue converting them or sell on the market. The price makes little difference. Sales are being made all the way from $38 to $41 a ton at the mill, which is the price recently prevailing. Sheets are strong at the advance. Bar iron, despite high scrap prices, holds at 1.65@1.70c. Youngstown. Premiums are being paid for plates and shapes in small quantities, the business going to Eastern mills.

New York Nov. 7

Pig Iron—The market has been again active, and prices are higher. For short deliveries on small orders, extra prices are asked and paid by buyers who must have iron. Larger purchasers are still in the market for next year. For first quarter delivery, Eastern furnaces are asking $22 at furnace for No. 2X; while Southern furnaces are getting $17.50, Birmingham for No. 2 foundry.

Current quotations for pig iron are for New York or parallel delivery:

Northern:	
No. 1 X foundry	$23.50@$25
No. 2 X foundry	22.50@24
No. 2 plain	21.50@23
Forge pig	19@20
Southern:	
No. 1 foundry	22@23.50
No. 2 foundry	21.50@23
No. 3 foundry	21@21.50
No. 4 foundry	19.50@21
No. 1 soft	22@23.50
No. 2 soft	21 50@23
Gray forge	17.75@19
Basic pig:	
Northern	19.50@20
Virginia	20@21
Alabama	20@20.50

City or local deliveries are not included in prices, which are for large lots, on docks or cars.

Cast-Iron Pipe—Orders are coming in steadily. The minimum price is $32 for 6-in pipe, carload lots, for 1907 delivery. Premiums are asked for early deliveries.

Bars—Bars are strong at 1.845c. tidewater, for common iron, while refined has sold for 1.895c. Steel bars are quoted at 1.645@1.745c., according to size and conditions of orders. Store trade is steady at 2.50c. delivered.

Structural Material—More new contracts are forward, and the chief trouble is to secure deliveries. Quotations for tidewater delivery are: Beams, channels and angles, 1.845c.; tees, 1.805c.; deck-beams, 1.995c. On beams 18 to 24 in., and on angles over 6 in., there is an extra of 0.10c. Material from jobbers, out of stock, is 2.25@2.50c. Premiums are the rule for special deliveries.

Old Material—Dealers are hustling, after heavy cast scrap and taking their own price from customers. No. 1 yard wrought is $18@$19; No. 1 machinery cast, $17.25@17.50. Heavy steel melting scrap is in demand at $16@$17. Prices are on cars, Jersey City or other tidewater terminal.

Philadelphia Nov. 7

Pig Iron—Feverish conditions prevail in the pig-iron market. There is a scramble right and left and it is extending to England and Scotland. Large purchases have been quietly arranged for abroad and special efforts are being made to secure the promptest delivery possible. The prices of foreign material are keeping up with the domestic level and they will soon be at a parity, the only advantage being that iron can be had by importation where otherwise it would be impossible to obtain a sufficient running stock. Quotations are creeping up and, bad as they are, they do not represent the prices that are sometimes paid. The greatest pressure is for basic, but there is a scramble for all kinds and there is only a fractional capacity left for the first three months of next year. Engineering plants and foundries have been very urgent and some large contracts have been successfully placed in this market within a week. There is also a strong pressure from the makers of machine tools and power generating machinery. Our brokers speak of a speculative tendency and there are symptoms of it. Quotations might as well be omitted so far as truthfulness is concerned. No. 1 X foundry has been quoted as high as $26 and some business has been done at $24. No. 2 X foundry is quoted at $23@23.50; standard gray forge at $20 @21; Middlesboro on dock is quoted today at $22.50, with Scotch at $23.

Steel Billets—There is a greater pressure for steel and $36 has been paid in some cases. It is not known just how much business is on the market today, but it is a great deal more than can be taken care of.

Bars—An upward tendency in bar iron is now anticipated, which will bring it in harmony with the rest of the market. The greatest pressure this week is for steel bars.

Sheets—Sheet-card rates are given at 2.60@2.90 with an upward tendency and higher prices for favorable deliveries. The chief demand at present is for small lots and the stores throughout this territory are all doing a good business.

Pipes and Tubes—The pipe market is strong although the volume of business transacted here is never of very large proportions. Merchant pipe is also very strong. The new rates on iron pipe and merchant pipe are easily maintained. It is not a question of price, but of pipe.

Merchant Steel—The consumers of merchant steel in this territory are hurrying in their orders and a good week's business is reported.

Plates—The plate market is stronger than ever, prices are advancing, early deliveries are more difficult to obtain and there is sufficient inquiry to bring about a still farther advance.

Structural Material—The old story can only be repeated of the strain on capacity. The feature this week is a greater increase in the inquiries for small quantities for commercial structures, such as warehouses, office buildings, boiler-shop requirements and the like.

Steel Rails—Nothing of particular moment has transpired in the steel-rail market.

Scrap—The scrap situation has improved and some active buying is reported every day. Several large scrap users have recently made efforts to place contracts for No. 1 steel scrap and No. 1 yard scrap and it is probable that they can obtain the material if they will pay the price. No. 1 steel is quoted today at $18.50; No. 1 yard at $20; railroad at $22.50 and machinery scrap at $19.

Pittsburg Nov. 6

Production records were broken at almost every plant of the United States Steel Corporation during the month of October, the result of the extraordinary efforts being entirely satisfactor. The only plant of the Carnegie Steel Company that did not increase its output last month was the great works at Homestead where production amounted to over 180,000 tons, but this was not a record. The rail production at the Edgar Thomson plant was within a few tons of 90,000, a gain of 7000 tons from the previous high record. Despite the increased output, the mills are still behind in deliveries and a great deal of this year's business will go over into next year.

Specifications and new orders for steel bars and other finished products continue in excess of production, and mills are getting farther behind in shipments on some lines. The car supply is bad and it is impossible to guarantee delivery. Although the demand in all finished lines is heavy, prices remain unchanged. Steel bars are still quoted at 1.50c. while iron bars have advanced to 1.70c. It had been intended to advance steel hoop prices on Nov. 1, but just before the order was issued it was called off for some reason. It is reported, however, that an increase in prices soon will be made.

The Carnegie Steel Company this week booked orders for 20,000 tons of standard steel rails and 2500 tons of light rails. It is estimated that orders for rails for next year's delivery already placed exceed 2,000,000 tons and it is confidently believed that over 3,000,000 tons, or the entire capacity of the mills, will be contracted for.

Pig Iron—Although it had been repeatedly declared by pig-ron producers and brokers that the entire production up to July 1 had been sold, the sales of the past week aggregated 50,000 tons of bessemer and basic iron, including the 25,000 tons noted in the last report. The prices for this iron ranged from $19.50 to $22, Valley furnaces. Many inquiries for bessemer iron for second half have been re-

ceived, but so far no contracts have been reported for standard bessemer. According to one of the largest producers the price for both bessemer and basic iron for the last half of next year will be $21, Valley furnaces. It was announced today by several pig-iron interests that large sales for second half may be expected between Nov. 10 and 15. While the election today is not expected to have any influence on the iron and steel situation, buyers evidently prefer to wait a few days before closing for their future requirements. In addition to the sale of 30,000 tons of malleable bessemer reported from Chicago last week, about 20,000 tons of basic and malleable were sold and represent, it is said, the entire sales for second half. Sales of foundry iron were made during the past few days, but only in small lots and at fancy prices. Some Southern and Virginia iron has been sold in this market at prices ranging from $24.60 to $25.05 for No. 2 foundry. The Westinghouse Electric and Manufacturing Company has contracted for foreign iron and shipments are expected to arrive shortly. Gray forge is scarce and commands a high price, the range being from $20.85 to $21.35, Pittsburg. No. 2 foundry iron is quoted nominally at $22, Valley furnaces, but none seems to be available. For prompt bessemer iron, a broker said $25, Valley, could easily be obtained.

Steel—A few sales of bessemer and open-hearth billets are noted this week at unusually high prices, $29 being paid for bessemer and $30 for open-hearth. Sheet bars have sold at $31 and for next year $30 is quoted. The plate mills are sold up for many months ahead and there is not likely to be any change in prices, 1.60c. still being named for tank plates. Steel bars remain at 1.50c. despite the fact that iron bars are selling at $4 a ton more.

Sheets—The advance in prices did not check buying and new business is being booked daily. Black sheets are quoted at 2.60c. and galvanized at 3.65c. for No. 28 gage.

Ferro-Manganese—The market remains unchanged and 80 per cent. ferro is still quoted at $84 to $85 a ton.

Dusseldorf, Germany Oct. 8

The output of the German blast furnaces in August, as reported by the German Iron and Steel Union, was 1,064,957 metric tons of pig iron. This was 23,510 tons more than in July, and was the highest monthly production this year. For the eight months ending Aug. 31, the total make of pig iron was, in metric tons:

	1905. Tons.	1905. Per Ct.	1906. Tons.	1906. Per Ct.
Foundry iron	1,210,159	17.3	1,407,438	17.1
Forge iron	530,802	7.6	569,131	6.9
Steel pig	435,820	6.2	614,020	7.5
Bessemer pig	280,980	4.0	315,762	3.8
Thomas pig	4,552,055	64.9	5,329,879	64.7
Total	7,009,816	100.0	8,236,230	100.0

Steel pig, in the German classification, includes spiegelesien, ferro-manganese, ferro-silicon and all similar alloys. The increases this year were, in foundry iron, 197,279 tons; forge iron, 38,329; steel pig, 178,200; bessemer pig, 34,782; Thomas, or basic, pig, 777,824 tons. The total gain was 1,226,414 tons, or 17.5 per cent. The only considerable change in proportions was the large increase in steel pig this year.

Exports of iron and steel, and of machinery, from Germany for the eight months ended Aug. 31 were as follows, in metric tons:

	1905.	1906.	Changes.
Iron and steel	2,064,814	2,417,635	I. 352 821
Machinery	193,035	185,000	D. 8,035
Total	2,257,849	2,602 635	I. 344,786

Exports of iron ore, chiefly to France and Belgium, for the six months March-August inclusive, were 1,867,197 tons.

Imports of iron and steel, and of machinery, into Germany for the eight months ended Aug. 31 were, in metric tons:

	1905.	1906.	Changes.
Iron and steel	208,043	380,970	I. 172,927
Machinery	55,390	59,713	I. 4,323
Total	263,433	440,683	I. 177,250

Imports of iron ore for the six months March-August, inclusive, were 3,226,258 tons. These imports were chiefly from Spain and Sweden. Imports of manganese ore for the same period were 192,921 tons.

Cartagena, Spain Oct. 13

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 3600 tons dry ore, to Rotterdam; one cargo, 2600 tons dry ore, to Great Britain; a total of 6200 tons. Demand continues strong and quotations are about 3d. higher. Manganiferous ores are scarce.

Quotations are 9s. 1d.@9s. 4d. for ordinary 50 per cent. ore; 9s. 7d.@9s. 10d. for low phosphorus; 11s. for S. P. Campanil; 12s. 4d. for specular ore, 58 per cent. Manganiferous ores range from 13s. 3d. for 35 per cent. iron and 12 manganese up to 15s. 6d. for 25 per cent. iron and 17 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur are 1s. per ton, f.o.b. shipping port.

Chemicals

NEW YORK, Nov. 7

Copper Sulphate—There is nothing new to report in the copper sulphate market. Prices remain unchanged at $7 per 100 lb. for carload lots, with smaller parcels bringing $7.25@7.50, depending upon terms and quantity.

Exports of copper sulphate from the United States for the nine months ending Sept. 30 were 17,657,000 lb. in 1905, and 18,447,924 lb. in 1906; an increase of 790,924 lb. this year.

Nitrate of Soda—Messrs. Mortimer & Wisner's circular gives the following statistics of nitrate for the United States, as of date Nov. 1, in long tons:

	1905.	1906.	Changes.
Stocks, Jan. 1	8,380	13,100	I. 4,720
Imports, 10 months	217 900	240,780	I. 22,880
Total supplies	226,280	253,880	I. 27,600
Deliveries, 10 months	219,030	242,680	I. 23,650
Stocks, Nov. 1	7,250	11,200	I. 3 950
Afloat for U. S.	99,400	91,200	D. 8,200

The tonnage reported afloat includes all cargoes reported which are due to arrive by Jan. 15 next.

Heavy Chemicals—Imports of heavy chemicals into the United States for the nine months ending Sept. 30 were, in pounds:

	1905.	1906.	Changes.
Bleaching powder	75 043,912	77,419.001	I. 2,375,089
Potash salts	182,604.613	198.513,667	I.15,990 05
Soda salts	21,531,503	15,206,713	D. 6,324,79[illegible]

Exports of acetate of lime for the nine months were 50,399,165 lb. in 1905, and 51,620,542 lb. in 1906; an increase of 1,221,377 lb. this year.

Sulphur—Imports of sulphur and pyrites into the United States for the nine months ending Sept. 30 are reported as below, in long tons:

	1905.	1906.	Changes.
Sulphur	62,651	62,835	I. 184
Pyrites	377,607	426,208	I. 48,601

Estimating sulphur contents of the pyrites, we find that the total sulphur imported was, approximately, 213,694 tons in 1905, and 233,318 tons in 1906; an increase of 19,624 tons.

Phosphates—Exports of phosphates from the United States for the nine months ending Sept. 30 were 743,475 tons in 1905, and 773,798 tons in 1906; an increase of 30,323 tons. The principal exports this year were to Germany and Holland, 311,199 tons; Great Britain, 121,630; France, 95,771; Italy, 88,062; Belgium, 40,586 tons.

Metal Market

NEW YORK, Nov. 7.

Gold and Silver Exports and Imports.
At all United States Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1906	$2,278,922	$31,419,932	Imp $29,141,010
" 1905	1,412,904	5,432.692	" 4,130,788
Year 1906	35,790.962	111 764,911	" 75 973,949
" 1905	42,677,921	30,339,602	Exp. 12,338,319
Silver:			
Sept. 1906	3,594,311	3,253.586	" 340,725
" 1905	5,527,459	3,840 000	" 1,687,454
Year 1906	45,441,339	32,985,096	" 12,456,243
" 1905	39,443,210	24,506,998	" 14,936,212

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.
For week ending Nov. 3 and years from Jan. 1.

Period.	Gold. Exports.	Gold. Imports.	Silver. Exports.	Silver. Imports.
Week	.....	$ 202,096	$ 330,635	$ 41,870
1906	$8,022.183	94,410,135	44,982,610	1,891,080
1905	34,430,003	10,405,053	29,319,712	3,805,597
1904	84,804,981	5,545,822	31,389,760	904,344

No gold was exported during the week; exports of silver were chiefly to London. Imports for the week, both gold and silver, were from Cuba, Central and South America.

The statement of the New York banks —including all the banks represented in the Clearing House—for the week ending Nov. 3 gives the following totals, comparisons being made with the corresponding week of 1905.

	1905.	1906.
Loans and discounts	$1,058,272,400	$1,052,790,900
Deposits	1,052,778,500	1,015,824,100
Circulation	54,358,500	49,024,700
Specie	190,464,600	187,652,200
Legal tenders	75,084,300	69,353,600
Total reserve	$265,548,900	$257,005,800
Legal requirements	263,194,625	253,956,025
Surplus reserve	$ 2,354,275	$ 3,049,775

Changes for the week this year were an increase of $2,300,100 in circulation; decreases of $9,542,300 in loans, $18,874,000 in deposits, $6,697,400 in specie, $645,000 in legal tenders and $2,623,900 in surplus reserve.

The following table shows the specie holding, in dollars, of the leading banks of the world:

	Gold.	Silver.	Total.
New York	.....	.....	$187,652,200
England	$142,749,255	.....	142,749,255
France	562,577,150	$203,361,970	765,939,120
Germany	138,170,000	46,060,000	184,230,000
Spain	76,575,000	121,285,000	197,860,000
Netherlands	27,656,500	27,860,000	55,516,500
Belgium	16,260,000	8,130,000	24,390,000
Italy	154,915,000	18,720,000	173,635,000
Russia	564,230,000	22,300,000	586,530,000
Austria	234,400,000	58,850,000	293,250,000
Sweden	19,375,000	.....	19,375,000

The returns of the associated banks of New York are of date Nov. 3, and the others Nov. 2. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Indian exchange has been easier, and the Council bills offered in London were taken at an average of 16d. per rupee. Shipments of silver to India have been moderate.

The Treasury Department's estimate of the amount and kinds of money in the United States on Nov. 1 is as follows:

	In Treasury.	In Circul'n.
Gold coin (inc bullion in Treasury)	$1,566,619,131	$ 687,686,761
Gold certificates	.....	575,958,419
Silver dollars	561,339,530	83,606,468
Silver certificates	.....	473,419,449
Subsidiary silver	123,785,299	120,278,648
Treasury notes of 1890	6,912,000	6,894,518
U. S. notes	346,681,016	344,516,149
Nat. Bank notes	583,171,985	574,522,374
Total	$3,188,508,961	$2,866,882,786

Population of the United States, Oct. 1, 1906, estimated at 85,131,000; circulation per capita, $33.68. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. The statement of money held in the Treasury assets of the Government does not include deposits of public money in national bank depositaries to the credit of the Treasurer of the United States, amounting to $137,754,457. The amount in circulation on Nov. 1 was $54,749,092 more than on Oct. 1; and $213,751,208 more than on Nov. 1 last year.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.54	$0.55
Peruvian soles and Chilean	0.49¼	0.50¾
Victoria sovereigns	4.85½	4.87½
Twenty francs	3.87	3.91
Spanish 25 pesetas	4.78	4.80

SILVER AND STERLING EXCHANGE.

Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Nov.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
1	4.85½	70⅝	32 5/16	5	4.85¾	71	32¾
2	4.85½	70⅞	32 5/16	6	....	....	32¾
3	4.85¾	70⅝	32⅝	7	4.85¾	71⅛	32 3/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

November.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
1	22¼ @22½	21 5/16 @22	96 15/16	42¼	5.75	6.25 @6.30	6.10 @6.15
2	22¼ @22½	21 5/16 @22	97 3/16	43	5.75	6.25 @6.30	6.10 @6.15
3	22¼ @22⅜	21⅜ @22	....	43	5.75	6.30	6.15
5	22¼ @22½	21¾ @22	99⅛	43	5.75	6.30	6.15
6	.....	.....	99½	....	....	.....	.....
7	22¼ @22½	21¼ @22	99	42⅛	5.75	6.30 @6.35	6.15 @6.20

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations on spelter are for ordinarv western brands; special brands command a premium.

Copper—The market is substantially unchanged. Our reports indicate that consumption is continuing upon a very heavy scale, while there seems to be some delay in the deliveries of crude copper to the refineries through car shortage and otherwise. Some large sales during the week are reported. There is no doubt that the statistics of production this year will show only a small increase over last year. Under these conditions prices are well maintained. The close is steady and firm at 22¼ @22½ for Lake copper, and 21½@22c. for electrolytic in ingots, cakes and wirebars. The average at which business in casting was done during the week was 21¼@21½c.

After the abrupt break of the previous week, which was accompanied by a great deal of bear selling, there has been considerable covering which resulted in an advance in the London standard market, which closes steady at £99 for spot, £100 for three months.

Statistics for the second half of October show an increase in the visible supplies of 100 tons.

Refined and manufactured sorts we quote: English tough, £101@102; best selected, £104@105; strong sheets, £108@109.

Copper Exports and Imports—The exports of copper from the United States for the nine months ending Sept. 30 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons:

	1905.	1906.	Changes.
Great Britain	21,199	17,579	D. 3,620
Belgium	1,504	1,720	I. 216
France	24,565	26,484	I. 1,919
Italy	5,224	5,929	I. 705
Germany and Holland	81,291	87 402	I. 6,111
Russia	7,103	2,757	D. 4,346
Other Europe	8,411	8,538	I. 127
Canada	1,009	1,469	I. 460
China	33,119	1,802	D. 31,317
Other countries	6,975	172	D. 6,803
Total metal	190,400	153,852	D. 36,548
In ores and matte	4,441	4,564	I. 123
Total	194,841	158,416	D. 36,425

The total decrease was 18.7 per cent. If, however, we omit the exports to China in both years, the decrease remaining is only 5108 tons, or 3.2 per cent. The actual quantities of ore and matte exported were 26,388 tons in 1905, and 34,127 tons in 1906; contents are estimated chiefly on the basis of values. Of the ore and matte exported this year 24,834 tons went to Canada, 9090 tons to Mexico, and 203 tons to other countries.

Imports into the United States of copper and copper material for nine months, ending Sept. 30, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico	29,014	10,722	39,736
Canada	10,772	3,561	14,333
Great Britain	6,647	.....	6,647
Japan	1,692	.....	1.692
South America	.....	2,181	2 181
Other countries	8,208	722	8,930
Total imports	56 333	17,186	73,519
Re-exports	499	57	556
Net imports	55,834	17,129	72 963
Net imports, 1905	52,619	15,613	68,232

The total increase this year in the net imports was 4731 tons, or 7 per cent. The actual tonnage of ores and matte from Mexico this year was 78,603; from Canada and Newfoundland, 45,752; from South America, 7769 tons.

The excess of exports over net imports was 126,609 tons in 1905, and 85,453 tons in 1906; a decrease of 41,156 tons this year.

Exports of copper from New York for the week were 2553 long tons. Our special correspondent reports the exports from Baltimore for the week at 1585 long tons of fine copper; also 559 tons of copper ore.

Copper Sheets—The base price of copper sheets, as established by the manufacturers, is 27c. per lb. This price is subject to change without notice.

Tin—Upon the publication of the statistics which showed a decrease during the month of October of 700 tons, speculation in London was stimulated and prices advanced several pounds. At the close, however, the market shows a drooping tendency, the quotations being cabled as £198 for spot, £195 for three months. Prices here are ruling at about 42½@42¾ depending upon deliveries.

Imports of tin into the United States for the nine months ending Sept. 30 were as follows, in long tons, of 2240 lb. each:

	1905.	1906.	Changes.
Straits	15,565	10,930	D. 4,635
Australia	424	792	I. 368
Great Britain	14,869	20,170	I. 5,301
Holland	320	386	I. 66
Other Europe	652	1,165	I. 513
Other countries	41	234	I. 193
Total	31,871	33,677	I. 1,806

The total increase this year over 1905 was 5.7 per cent.

Stocks of tin reported on Nov. 1 were as follows, in long tons:

	Store.	Afloat.	Total.
London	1,906	4,081	5,987
Holland	697	183	880
United States	1,035	3,260	4,295
Total	3,638	7,524	11,162

United States stocks do not include Pacific ports.

Lead—The market is unchanged at 5.75 New York.

The London market has recovered somewhat and the close is steady at £19 7s. 6d. for Spanish lead, £19 10s. for English lead.

Imports of lead in all forms into the United States for the nine months ending Sept. 30, with re-exports of foreign metal, were as follows, in short tons:

	1905.	1906.	Changes.
Lead, metallic	3,166	10,991	I. 7,825
Lead in ores and base bullion	73 516	56,411	D. 17,105
Total imports	76,682	67,402	D. 9,280
Re-exports	47,148	35,908	D. 11,240
Net imports	29,534	31,494	I. 1,960

Of the lead imported this year 52,809 tons were from Mexico, and 6531 tons from Canada. There were 7894 tons imported from Europe. Exports of domestic lead were 221 tons in 1905, and 233 tons in 1906; an increase of 12 tons.

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on Nov. 7 as follows: Lead is quiet. Prices are 5.87½c. for ordinary Missouri lead, and 5.95c. for corroding brands.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Oct. 13, that the price of pig lead is 87.75 reales per quintal, silver being paid for at 13.75 reales per ounce. Exchange, 27.24 pesetas to £1. The price of lead, on current exchange is equal to £17 18s. per long ton, f.o.b. Cartagena. Exports for the week were 200 tons desilverized lead to Great Britain; 130 tons to Marseilles.

Spelter—A good demand from all sources has infused some life into the market and under the stimulus of buying on the part of consumers and speculators prices have advanced somewhat and close firm at 6.30@6.35 New York, 6.15@6.20 St. Louis.

The London market is dull and prices at the close are somewhat lower, £27 10s. being quoted for good ordinaries, £27 15s. for specials.

Exports of spelter from the United States for the nine months ending Sept. 30 were 2431 short tons in 1905, and 3622 tons in 1906; an increase of 1191 tons. Exports of zinc ore were 18,256 tons in 1905, and 22,730 tons in 1906; an increase of 4474 tons. Exports of zinc dross were 10,652 short tons in 1906; this article was not reported separately last year.

Imports of spelter were 497 short tons in 1905, and 2123 tons in 1906; an increase of 1626 tons.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Oct. 13, that the market remains quiet. Shipments for the week were 550 tons blende to Antwerp.

Zinc Sheets—The price of zinc sheets was raised 15c. on Oct. 25. It is now $7.90 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The base price for sheet zinc has varied little this year; the highest was $8 on Jan. 6, the lowest $7.65 on May 18.

Antimony is firm. Large transactions have taken place at advancing prices and at the close spot is quoted at 24@25c. for common grades, and 25½@26½ for specials. Future deliveries can be bought at 23@23½ cents.

Imports of antimony into the United States for the nine months ending Sept. 30 are reported as below, in pounds.

	1905.	1906.	Changes.
Metal and regulus	3,527,904	5,309,067	I. 1,781,163
Antimony ore	1,399,730	1,470,767	D. 71,037

The increase in metal this year was 50.5 per cent., and that in ore was 5.1 per cent.

Nickel—Quotations for large lots, New York or other parallel delivery, as made by the chief producer, are 45@50c. per lb. for large orders, according to size of order and terms. For small lots, 50@65c. is charged.

Imports of nickel ore and matte into the United States for the nine months ending Sept. 30 were 10,167 tons in 1905, and 11,219 tons in 1906; an increase of 1052 tons. Exports of nickel, nickel oxide and nickel matte for the nine months were 7,699,165 lb. in 1905, and 8,817,594 lb. in 1906; an increase of 1,118,429 lb. this year.

Platinum—The price continues $33 per oz. unmanufactured, while $25@27 is paid for scrap metal.

Imports of platinum into the United States for the nine months ending Sept. 30 were 5412 lb. in 1905, and 8663 lb. in 1906; an increase of 3251 lb. this year.

Quicksilver—This metal remains steady, with no material changes. The New York quotation is $40.50@42 per flask of 75 lb., according to size and conditions of order. San Francisco quotations are $39@40 per flask for home orders, and $37@38 for export. The London price is £7 per flask, with £6 18s. 9d. named by jobbers.

Exports of quicksilver from the United States for the nine months ending Sept. 30 were 815,257 lb. in 1905, and 407,619 lb. in 1906; a decrease of 408,638 lb. this year.

Aluminum—The chief producer gives list prices for ton lots and over as follows: No. 1, over 99 per cent. pure, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are from 1 to 3c. higher. Granulated metal is 2c. per lb. over price of ingots; rods, 1c. per lb. over ingots. Rolled sheets are 45c. per lb. up, according to size.

Exports of aluminum from the United States for the nine months ending Sept. 30 were valued at $193,580 in 1905, and $225,410 in 1906; an increase of $31,830 this year.

Wisconsin Ore Market

PLATTEVILLE, Nov. 3

It was thought by some at the beginning of the week that there would be no increase in price. The buyers, however, raised the price voluntarily, the basis of 60 per cent. ore ranging from $43.50 to $44.50. Several fancy grades brought as high as $48, this being the price paid for several cars of Empire ore.

Lead is scarce and commands good prices, 80 per cent. ore selling at $40 per thousand. One or two lots of 78 per cent. ore were sold at $37.50. Drybone and sulphur same as last week.

The camps of the district loaded ore as follows for the week ending Nov. 3:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	420,015	.....	.....
Highland	329,900	.....	.....
Benton	269,000	.....	.....
Buncombe & Hazel Green	124,500	.....	.....
Dodgeville	123,000	.....	.....
Linden	115,510	.....	.....
Cuba City	66,200	.....	.....
Rewey	53,000	.....	.....
Mineral Point	37,870	.....	39,120
Total for week	1 478,995	.....	39.120
Year to Nov. 3	64,671,841	3,015,900	3,493,030

The Galena roaster scored another victory. It being claimed by a local engineer that the Empire ore would sell more profitably unroasted, in order to prove the claim the owners concluded to sell one car without treating in the separating plant and received only $23 per ton, against $48 for the roasted. After all figures were in it was found that the $25 difference more than paid for the cost of separating and all losses due to magnetic separation and that roasted ore was far the more profitable to market.

The majority of the ore of the district was purchased by Grasselli Brothers.

Missouri Ore Market

JOPLIN, Oct. 27

The highest price paid for zinc was $48 per ton, on an assay basis price of $43 @45 per ton of 60 per cent. zinc. The average price, all grades, was $43.56.

The highest price paid for lead was $83 per ton, but medium and lower grade ores sold higher, bringing the average up to $80.10 per ton.

With a shipment of 6140 tons of zinc, shippers were complaining all week of an inability to secure needed cars to move the reserve stock purchased the two preceding weeks, and the decrease from the previous week was 845 tons, though it was 815 tons greater than an average of the 43 preceding weeks of the year.

In an endeavor to secure a larger proportion of the output local lead smelters advanced prices on medium and lower-grade ores, resulting in like advances by the St. Louis Smelting and Refining Company in order to retain the usual tonnage. It is rumored that the lead smelter at Galena, Kan., is to be started soon, which will add to the already sharp competition.

Following are the shipments for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,463,700	728,300	$105,330
Joplin	2 968.200	220 910	75,621
Galena-Empire	1,119,940	173,430	30,916
Alba	773,420	4,920	18,367
Duenweg	330,970	139 670	14,867
Prosperity	420,300	127,680	14,353
Neck City	551,170		13,052
Badger	493 430		11,595
Aurora	606 700	20,530	11,573
Baxter Springs	259,970	122,130	10,344
Granby	360 000	46,000	6,900
Spurgeon	274,730	47,100	6,444
Carthage	260,500		5,991
Oronogo	223 610		4,790
Stott City	172 480		4,466
Totals	12,279,120	1.630,570	$334,612
44 weeks	470,290,420	66,157,340	$12,704,445

Zinc value, the week, $267,450; 44 weeks, $10,155,041
Lead value, the week, 67,162: 44 weeks, 2,549,404

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc.

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.83
March	47.40	42.68	March	57.20	73.73
April	42.88	44.68	April	58.00	75.13
May	43.31	40.51	May	58.27	78 40
June	40.75	43.83	June	57.80	80.96
July	43.00	43.25	July	58.00	74.31
August	48.83	43.56	August	58.00	75.36
September	46.75	42.58	September	63.50	79.64
October	47.60	41.55	October	63.86	79.84
November	49.55	....	November	68.67	....
December	49.00	....	December	76.25	....

Mining Stocks

NEW YORK, Nov. 7

The market has been extremely quiet and largely professional during the past week and public interest has centered mostly on the Broad street curb where the mining boom continues unabated.

On the Exchange, the lethargic condition has been due to the intense feeling over the election and a rise in values has been confidently expected in the event of a Republican victory. However, this was not realized at the opening this morning and stocks were heavy and showed a loss over Monday's close.

Amalgamated has been quiet, fluctuating fractionally between $111¾ and $109½ ex-dividend, and closing at the higher price. It opened this morning at $111¼. American Smelting, common, ranged between $156⅞ and $152⅝, closing at the first named figure. The rest of the mining list showed little strength.

On the curb the Cobalt mining stocks were the feature. Nipissing has been steadily sold from its high price of $33⅞ and receded to $30½ on large profit-taking dealings. McKinley-Darragh rivaled Nipissing in point of activity and heavy dealings sent the price to $4⅛.

British Columbia, Cumberland-Ely, Guggenheim Exploration, Gold Hill, Montgomery-Shoshone, Nevada Smelting and United Copper, all showed substantial gains for the week.

Boston Nov. 6

Mining shares are again picking up after a moderate reaction and breathing spell. The stability of the metal market and the reports of Calumet & Hecla sales naturally stimulated trading in the stock market and the better grade of coppers recorded sharp advances. North Butte after a $5 rise to $117.50, fell back to $113 Monday. Osceola rose $4.75 to $129, retaining all but a fraction, and Copper Range rose $4 to $84.12½ on excellent buying.

Centennial was also conspicuous, and selling up $3 to $32.62½ on heavy trading and buying from the Lake. From all accounts this property has developed into a going mining proposition. Negotiations are also pending to sell half of its six stamp mills, which will enable the company to pay its debt. Utah Consolidated was well bought up to $68.87½, an advance of $2.87½, and United Copper rose $3.62½ to $68.50. There is talk of listing this company's stock on the New York exchange. Greene Consolidated also gave a good account of itself by advancing $2.12½ to $28.37½, Union Copper, Land and Mining became active and touched $4.25. Negotiations are on to sell a large tract of land which will likely yield a $2 dividend to stockholders. Butte Coalition has been up from $37 to just under $38. Dividend No. 2 of 40c. a share was declared Monday.

Arcadian sold up $1.50 to $6.50 and Calumet & Arizona finished Monday at $150 and Nevada Consolidated rose $2.12 to $21.75. Michigan has been in good request, selling up to $18.75 and Santa Fe has been active, touching $3.25. Calumet & Hecla touched $870 Monday. Amalgamated is up $1.50 for the week to $112.50.

Trading on the curb is broadening. The trend of prices has generally followed that of the stock exchange. Balakalala, Cananea, Central Nipissing and Superior & Pittsburg have been the features.

The Champion Mining Company has declared its ninth dividend this year of $1 per share. The annual report of the Mexico Consolidated covers a period of two years to June 30 last. The gross increase for the period was $319,803 from the sales of ore and concentrates and $191,403 from miscellaneous sources, including working capital. Expenses were $261,690, leaving a surplus of $249,516 for the year.

Colorado Springs Nov. 2

The Colorado Springs Mining Exchange has enjoyed a very active week and the majority of Cripple Creek stocks have been in good demand and at strong prices. The output of the Cripple Creek district for the month of October was some in excess of the previous month, amounting to 42,800 tons with a value of $1,570,300. Several rich strikes have been reported during the past seven days, and an increased interest in stocks seems to have resulted.

San Francisco Nov. 1

The Comstock shares opened irregular and rather weak. Later much strength developed, and for the past two days prices have been advancing, and there has been more activity than for many months past.

The market for Southern Nevada shares, on the other hand, was broad and active. Tonopah stocks were rather easy, but there was strong demand for Goldfield and Bullfrog shares. Mohawk was the leader, advancing sharply, with a good deal of excitement.

Associated Oil has been bought well, at advancing prices. Other oil stocks are not in active demand.

The San Francisco & Tonopah Mining Exchange has been reorganized and began sessions in this city on Wednesday. This board suspended operations at the time of the big fire. Oakland capitalists took advantage of the situation to induce many brokers to aid in the organization of the exchange in that city, promising generous support and business. For a short time the new organization flourished and then the San Francisco members discovered that the interest of many of the capitalistic promoters had ceased with the launching of the new exchange. Another discovery was that 90 per cent. of the buying and selling of mining stocks is done in San Francisco. So the dissatisfied brokers concluded to revive the old board that had transacted business for four years in this city in the Mills Building.

STOCK QUOTATIONS

NEW YORK. Week Nov. 3.

Name of Company.	High	Low	Clg.	Sales
Amalgamated*	111¾	109½	111¾	206,300
Anaconda	273	266	272¾	41,200
British Col. Copper	14⅜	13¼	14¼	48 800
Butte Coalition	38	36⅛	37½	2,325
Cum. Ely Mining	14	12⅝	13⅝	16,100
Greene Gold.	2	1⅞	1⅞	1,725
Greene Gold & Silver.	2	1⅝	2	5,095
Guanajuato	4⅞	4⅜	4⅞	1,200
Micmac	6¾	6	6¼	27,115
Mines Co. of Am	1⅝	1½	1⅝	8,200
Mitchell Mining	6¼	5⅝	6	43 975
Mont. Sho. Con. (New)	16¼	14½	16	3,900
Nev. Utah M. & S.	5	4⅜	4⅜	15,500
Nipissing Mines	33⅞	28¼	31¾	227,000
Tennessee Copper	45⅜	45	45⅜	1,310
Union Copper	1 1/16	⅞	⅞	2,972
Utah Apex	8	8	8	1,400

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	156⅛	152⅝	155	50,050
Am. Smelt. & Ref., Pf.	119	116⅜	118½	2,320
Bethlehem Steel	18	18	18	100
Colo. Fuel & Iron	53¼	50⅜	52¼	16,900
Federal M. & S., Pf.*	97¾	96⅜	97¾	260
Inter. Salt*	38	36⅞	37	2,860
National Lead	76¾	74	75¾	5,000
National Lead, Pf	103½	103⅛	103½	361
Pittsburg Coal	16½	16¼	16⅜	1,100
Republic I. & S.	36	34⅜	35⅜	4,300
Republic I. & S., Pf.	98	97	97⅜	2,600
Sloss-Sheffield	73	72	73	1,100
Tenn. C. & I.	160	157⅛	160	600
U. S. Red. & Ref	31	27⅞	28⅛	3.400
U. S. Steel	48¼	46	47⅛	397,965
U. S. Steel, Pf.	107	106¾	106⅜	28 975
Va. Car. Chem	37⅞	37	37½	1,250

BOSTON Nov. 3

Adventure	6⅛	5¾	6¼	1.746
Allouez	39½	37	39	2,748
†Am. Zinc	32	30	31½	671
Atlantic	15⅞	15	15½	1,107
Bingham	33	32	32½	1,797
Boston Consolidated	32⅜	32⅛	32⅜	1,705
Calumet & Arizona	150	145	150	3,041
Calumet & Hecla	863	850	855	68
Centennial	32⅛	28½	32⅛	23,715
Copper Range	82	79½	81¾	6,438
Daly-West	20⅝	20	20¼	5.882
Franklin	23½	21⅜	22¾	4,275
Granby	13¾	13	13¼	1,695
Greene Consolidated	25⅛	25	25¼	8,897
Isle Royal	25	23¼	24	1,100
Mass	9	8¼	8½	550
Michigan	18¼	17½	18	6,723
Mohawk	68⅛	67	68⅛	694
Mont. Coal & Coke new.	2½	2	2¼	4,119
Nevada	21¾	19	21¼	5,452
North Butte	117⅞	111½	113¾	29,051
Old Dominion	63¾	61⅞	63	8,438
Osceola	129	124	127½	4,619
Parrot	26¾	26	26⅛	788
Quincy	104	100	102½	489
Rhode Island	5	4½	4¾	835
Shannon	16¾	15½	16½	15,584
Tamarack	101	100	101	49
Tecumseh	16	15	15¾	1,332
Trinity	12¾	11¼	12	23,986
*United Copper, com.	68	64½	65⅝	4,475
U. S. Oil	10¼	10	10	610
U. S. Smg. & Ref.	65	63	64¾	8,563
U. S. Smg. & Ref., pfd.	46¾	45½	45½	5,330
Utah Copper	67¾	65⅜	67½	5.380
Victoria	7	6¼	6½	1,080
Winona	11⅛	10½	10½	1,615
Wolverine	158	156	157	133
Wyandotte	1½	1⅛	1½	300

*Ex. Div. †Ex. Rights.

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Am. Agri. Chem., 25¾—25; Comstock, .30—.23; Davis-Daly Est., 13¾—13; Gold Hill, 6—4½; Gugg. Exp., 326—322½; Rich. Eureka, 7¾; Standard Oil, 596—590. (Boston) Ahmeek, 100; Am. Zinc, †32—†30; Arcadian, 6½—5; Ariz. Com'l, 37½—37; Black Mt., 10; Cananea, 24½—24; East Butte, 9⅞; Keweenaw, 11⅝—11½; Majestic, 3¾—3½; Raven, .75; Shawmut, 1½; Superior Cop., 16¼; Superior & Pitts., 28½—27; Troy, 3⅞.

PHILADELPHIA Nov. 3

Name of Company.	High	Low	Clg.	Sales.
American Cement	10⅛	9⅞	10	4,242
Cambria Steel	38	37	37½	1,836
General Asphalt	8	7⅛	8	....
Penn. Steel, pd	107½	106	107½	....
Philadelphia Co	48¾	48¼	48¼	173
Tonopah Mining	20¼	19¼	20	3,343

PITTSBURG Nov. 3

Crucible Steel	13½	11½	13¼	4,230
Crucible Steel, Pf.	80¼	77¾	79¾	1,458
Harbison-Walker Ref.	14	13¾	14	2,260
Ohio Tonopah	.30	.27	.28	8,393
Tonopah Ext.	7⅞	5¾	7¾	22,010

COLORADO SPRINGS Nov. 3

Name of Company.	High	Low	Clg	Sales
Acacia	13½	13	13	9,500
C. C. Con	7⅜	6⅞	7	5 000
Dante	6¾	6	6	21,000
Doctor Jack Pot	10½	8	8¾	38,000
Elkton	52⅛	52⅛	52½	1,700
El Paso	54	51	51	7,800
Findley	57	55	56½	13,700
Gold Dollar	8⅛	7	7	....
Gold Sovereign	6⅞	6½	6½	....
Isabella	22	21¾	22	9 500
Jennie Sample	8½	8	8	....
Mary McKinney	73	71	72	8,800
Pharmacist	6⅝	6	6½	19,000
Portland	1.35	1.33	1.33	800
Vindicator	95	94	94	....
Work	25	22	22¼	44,000

SAN FRANCISCO Oct. 31.

Name of Company.	High	Low	Clg	Sales
Best & Belcher	1.15	.92	1.15	1,500
Caledonia	.50	.36	.48	3,700
Challar	.18	.11	.17	8,400
Con. Cal. & Va	1.05	.77	1.00	8,600
Crown Point	.24	.14	20	15,185
Gould & Curry	.30	17	26	9,000
Hale & Norcross	1.15	.95	1.15	2,100
Mexican	1.50	.88	1.50	6,600
Ophir	3.75	2.85	3.40	4,350
Overman	.17	.10	.15	7,000
Potosi	18	.12	.18	4,500
Savage	1.25	1.05	1.15	3,100
Sierra Nevada	.90	.46	.79	11,900
Bullfrog Mining	.57	.44	.56	52 500
Diamondfield B B. Con.	.42	.34	.42	41,600
Goldfield of Nevada	1.35	.72	1.35	69,750
Jim Butler	1.80	1.42	1.65	52,763
Jumping Jack	.57	.50	.52	9,350
Kendall	.80	.63	.70	50,350
MacNamara	.90	.81	.85	23,400
Manhattan Dexter	.54	.52	.54	4,600
North Star	49	.44	.44	27,200
Original Bullfrog	.15	.14	.15	23,550
Tonopah Belmont	6.87	6.37	6.87	3,050

Tonopah Stocks Nov. 7.

(Revised by Weir Bros. & Co., New York)

	High.	Low.	Last.
Tonopah Mine of Nevada	20.50	19.50	20.00
Tonopah Montana	4.40	4.30	4.40
Tonopah Extension	7.50	7.37½	7.25
Tonopah Midway	3.15	3.05	3.10
Tonopah West End Cons	2.50	2.35	2.45
Goldfield Mining Co.	1.30	1.18	1.25
Jumbo Mining	4.25	4.12½	4.25
Red Top	4.12½	4.00	4.12½
Sandstorm	.82	.79	.81
Montgomery Shoshone Cons	16.50	15.50	16.25

St. Louis Nov. 3.

Adams, $0.40 — $0.25; American Nettie, $0.08—$0.06; Center Creek, $2.30—$2.00; Central Coal and Coke, $64.50—$63.00; Central Coal and Coke, pfd., $80.00—$7.00; Central Oil, $60.00—$55.00; Columbia, $4.00—$3.80; Con. Coal, $25.50—$24.00; Doe Run, $160.00—$140.00; Granite Bimetallic, $0.20—$0.15; St. Joe, $15.00—$13.00.

LONDON. *(By Cable.*)* Nov. 7.

Dolores, £1 13s. 0d.; Stratton's Independence, £0 3s. 9d.; Camp Bird, £1 9s. 6d.; Esperaiza, £2 11s. 3d.; Tomboy £1 11s. 3d.; El Oro, £1 7s. 6d.; Oroville £1 1s. 9d.; Somera, £0 6s. 3d.; Utah, Apex, £1 13s. 2d.; Ariz. Copper, pref., £3 12s. 6d.; Ariz. Copper, def., £3 10s. 6d.

*Furnished by Hayden, Stone & Co., New York.

New Dividends

Company.	Payable.	Rate.	Amt.
Beck Tunnel, Utah	Nov. 15	$0.03	$30,000
Big Six, Colo	Nov. 1	0 00½	2,500
Calumet and Arizona	Dec. 20	4.00	800,000
Grand Central, Utah	Nov. 15	0.06	15 000
Greene Con. Copper	Nov. 30	0.40	40,000
Homestake S. Dak	Nov. 25	0.50	109,200
International Salt	Dec. 1	1.00	182.280
Sacramento, Utah	Nov. 1	0.00½	5,000
Shannon Copper	Dec. 20	0.50	150.000
U. S. Steel, com	Dec. 31	0.50	2,541,512
U. S. Steel, pfd	Nov. 30	1.75	6,304,919

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev	Nov. 9	Nov. 30	$0.05
Confidence, Nev	Nov. 7	Nov. 28	0.20
Con. California & Va	Nov 12	Dec. 3	0.25
Con. Imperial, Utah	Nov. 13	Dec. 11	0.01
Sierra Nevada, Nev.	Nov. 21	Dec. 17	0.10
Union Con., Nev	Nov. 7	Dec. 3	0.10
Utah, Nev	Nov. 5	Nov. 26	0 05
Yellow Jacket	Oct. 5	Nov. 5	0.10

Monthly Average Prices of Metals

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.113
February	61.023	66.108	28.047	30.464
March	58.046	64.597	26.794	29.854
April	56.600	64.765	26.108	29.964
May	57.832	66.976	26.664	30.968
June	58.428	65.394	26.910	30.185
July	58.915	65.105	27.163	30.113
August	60.259	65.949	27.822	30.529
September	61.695	67.927	28.528	31.483
October	62.034	69.523	28.637	32.148
November	63.849	.....	29.493	.....
December	64.850	.....	29.977	.....
Year	60.352	.....	27.839	.....

The New York prices are in cents per fine ounces; the London quotation is in pence per standard ounce, 0.925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan	15.008	18.310	15.128	18 419	68.262	78.896
Feb	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.641	68.174	81.111
April	14.920	18.375	15.045	18 688	67.017	84.793
May	14.627	18.457	14.820	18.724	64.875	84.867
June	14.678	18.442	14.813	18.719	65.881	83.994
July	14.888	18.190	15.005	18.585	66.887	81.167
Aug	15.664	18.380	15.725	18.706	69.830	83.864
Sept	15.965	19.033	15.978	19.328	69.667	87.831
Oct	16.279	21.203	16.332	21.722	71.406	97.269
Nov	16.599	.....	16.758	.....	74.727	.....
Dec	18.328	.....	18.398	.....	78.993	.....
Year	15.590	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	29.325	36.390	July	31.760	37.275
Feb	29.262	36.403	August	32.866	40.606
March	29.523	36.662	Sept	32.095	40.516
April	30.525	38.900	Oct	32.481	42.852
May	30.049	43.313	Nov	33.443	.....
June	30.329	39.260	Dec	35.835	.....
			Av. year	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	4.552	5.600	July	4.524	5.750
Feb	4.450	5.464	Aug	4.665	5.750
March	4.470	5.350	Sept	4.850	5.750
April	4.500	5.404	Oct	4.850	5.750
May	4.500	5.685	Nov	5.200	.....
June	4.500	5.750	Dec	5.422	.....
			Av., year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £16,850 per long ton; February, £16,031; March, £15,922; April, £15,959; May, £16,725; June, £16,813; July, £16,525; August, £17,109; September, £18,266; October, £19,350.

SPELTER.

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan	6.190	6.487	6.032	6.337	25.062	28.225
Feb	6.139	6.075	5.989	5.924	24.594	25.844
Mar	6.067	6 209	5.917	6.056	23.825	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	5.434	5.997	5.284	5.846	23.594	27.000
June	5.190	6.096	5.040	5 948	23.875	27.728
July	5.396	6.006	5.247	5.856	23.938	26.800
Aug	5.706	6.027	5.556	5.878	24.675	26.938
Sept	5.887	6.216	5.737	6.056	26.375	27.563
Oct	6.087	6.222	5.934	6 070	28.225	28.075
Nov	6.145	.....	5.984	.....	28.500	.....
Dec	6.522	.....	6.374	.....	28.719	.....
Year	5.822	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.